2007

Signaling Products

ALSTOM

The Source of Signaling Products for Over 100 Years

ALSTOM
Signaling Inc.

Welcome...

to the **2007 edition of the ALSTOM Signaling Products catalog**, your one stop source for your rail signaling needs.

Based on the success of last year's catalog and input from our customers, we have increased the number of new products this year to serve a wider number of applications. We have also rearranged some products and sections as well as provided more detail to certain products to allow you to use this catalog as an even more efficient tool than last year.

In addition, we have been working on our website to provide even more resources for you. If you do not find what you are looking for within this catalog, please try our website at **www.alstomsignalingsolutions.com** or call us toll free at **800 717-4477**. One of our dedicated, knowledgeable, and friendly customer service representatives will be happy to assist you.

If you have thoughts on how we might improve the catalog to better suit your needs, feel free to drop us an email at **info@alstomsignalingsolutions.com**.

We enjoy working with you and look forward to your continued business.

Barry F. Wharity
Director of Sales & Marketing

ALSTOM Signaling Inc.
2007 Products Catalog

ALSTOM Signaling is a leading manufacturer and distributor of Quality Signaling Products and Services.

We are part of the **Transport Sector** of ALSTOM, a $17 Billion USD Global Technology Company with locations in 70 countries and 70,000 employees!

Through the heritage of General Railway Signaling, or GRS as it was well known, ALSTOM Signaling Inc. has been a leading innovator of Signaling and Communication Technology. ALSTOM Signaling has delivered safe, proven products since 1904 with more than 2,400 patents registered to date. We have drawn from the experience and expertise gained from over 100 years in business to ensure that our customers in the Freight, Transit and Commuter markets will receive the best value for their purchases. Our goal in this relationship is to create a seamless overlap between our organizations to maximize efficiencies and effectiveness.

Building on this Century of Experience, ALSTOM has consistently set the Industry Standard for Safety and Quality in key product lines like Switch Machines, Relays, Interlocking Products, Signals, Track Circuits and Carborne Equipment. We are excited to offer a wide array of New Products that serve a larger number of applications and support the integration of Communication Tools in the Signaling market.

We are a customer-focused company and believe that our People are the key to our differentiation and success. We have over 150 engineers on our staff with an average of 20 years experience in the industry. In addition, we have a highly motivated support staff whose primary objective is to ensure Customer Satisfaction through dedicated service.

ALSTOM Signaling Inc. is headquartered in Rochester, NY in a 150,000 square foot facility. This facility includes manufacturing, engineering and all support functions. Additional satellite offices are strategically located throughout North America and Asia.

Our Goal is to continue to provide innovative solutions to our customers that will help them be more successful. This, coupled with our unwavering commitment to consistently meet and exceed our customers' expectations, has helped establish ALSTOM as a World Leader!

SYSTEM CERTIFICATION ISO 9001:2000 SGS

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Using the ALSTOM Catalog

Using the ALSTOM Catalog

This Catalog is designed to help guide you to find complete technical and ordering information on ALSTOM Wayside or Train Control System, Communication Solutions and stand-alone products. In addition, we continue to develop our New Products section in order to provide you with the best possible option for a one-source supplier. Each of our product pages gives concise features, design and application information, detailed specifications, and all major ordering part numbers. We also provide instructions on how best to place an order depending on the product.

For any additional information required:

- Contact one of our Customer Service Representatives at 1-800-717-4477
- Go to ALSTOM Signaling's Web Site at www.alstomsignalingsolutions.com
- Email us at info@alstomsignalingsolutions.com

The complete ALSTOM Signaling & Communications Catalog is also available electronically at ALSTOM's web site in .pdf format or on CD-ROM (Included with this catalog). Please contact our Customer Service department for additional copies of this catalog on CD.

For ordering information on customized systems without standard part numbers, consult with an ALSTOM Signaling Customer Service Representative.

To obtain prices of many individual components listed in this catalog, the ALSTOM Signaling online price book can be found at www.alstomsignalingsolutions.com

All sales of goods by ALSTOM Signaling are made solely upon terms and conditions that appear on the face of any quotation or order acknowledgment issued by us. Prices stated are those in effect on date of publication. However, prices are subject to change without notice, and prevailing prices will apply when your order is received.

Finding and Ordering Your System or Product

The 2007 ALSTOM Signaling & Communications Catalog is organized by major Product Family. To locate an item:

1. Refer to the Catalog Table of Contents (pages 6 & 7) for product and system divisions.
2. When your are ready to place an order, refer to the "Ordering Information" section of each catalog page. This section gives important information on how best to select the system or product of interest.

4 Easy Ways to Place Your Order

Call 800.717.4477

Fax 585.274.8777

Email info@alstomsignalingsolutions.com

Mail ALSTOM Signaling Solutions
Attn: Customer Service Center
PO Box 20600
Rochester, NY 14602-0600

Please make sure to include your shipping address, billing address, and Purchase Order number.
We would be pleased to provide quotations via phone, fax, or email.

T.O.C.

We Are Customer Advocates!

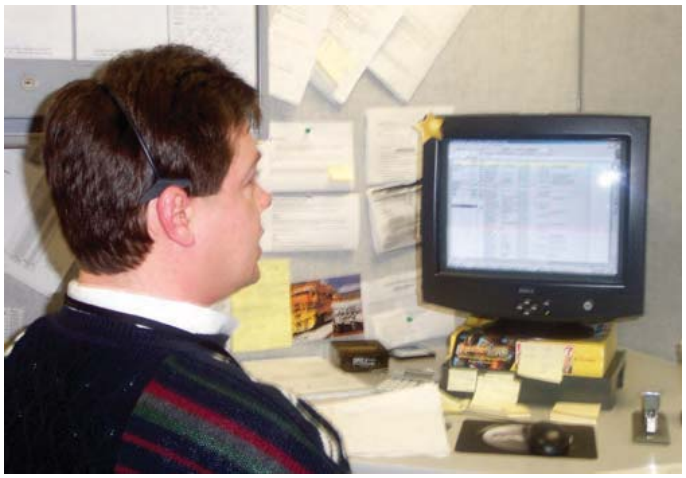
We believe that the customer is the heart of our organization. We are committed to providing the highest level of service before, during and after the sale.

Our staff of dedicated professionals averages 15 years of industry experience making it easy for you to do business with us. We promise quick and accurate responses to technical, pricing and order status questions. We take pride in our knowledge and it shows!

100 Years of Signaling Industry Experience at Your Service

Dedicated Customer Service Representatives – Making it easy for you to do business with us

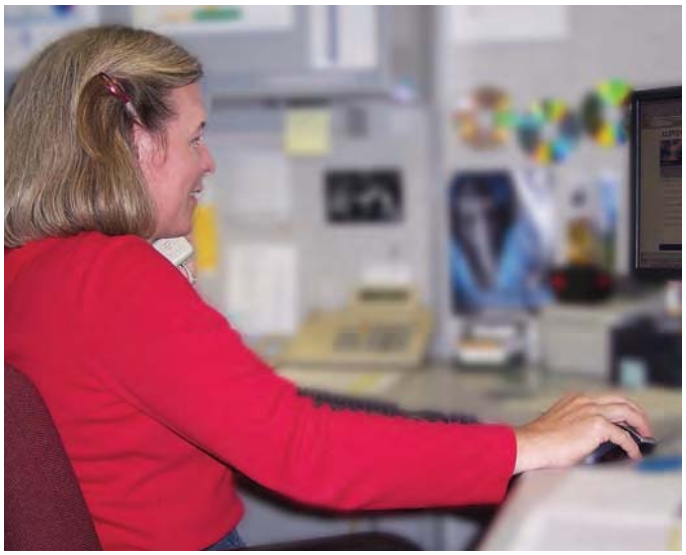
- **Proactive customer service**
- **Single point of contact to entire ALSTOM organization**
- **Quick responses to technical, pricing, and order status questions**



24 Hours a Day, 7 Days a Week (including all Holidays) Customer Service Representatives are Available

After Hours, etc. Call our 1-800-717-4477 and you will get the Emergency Cell Phone Number.

Call the Emergency Cell Phone # and you will get a Prompt Return call from a Live Person!



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Over 40 pages of NEW Products!

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Prices in U.S. Dollars Prices subject to change without notice

Clamp-On Meter

NEW

Features

- **Simple and fast clamp-on operation**
- **1000A AC or 1000A AC/DC current measurements**
- **750 V AC or 1000 V DC measurements**
- **Resistance measurement to 4000 Ω**
- **Continuity with beeper below 40 Ω**
- **Diode test**

The **Model 514 Clamp-on Meter** is a general-purpose professional TRMS measurement meter. This meter offers a complete set of measurement ranges and is in compliance with international safety and quality standards. It is fully functional to read AAC, ADC, VAC and VDS continuously with beeper frequency, diode test and hold. The model 514 is sized for comfortable one handed operation. The tapered and hooked jaw design makes measurements in crowded wiring panels a breeze.

Specifications

Data	Values
Measurement Range	AC Amps 0.05 to 1000 A rms ± 2.5% ± 5cts AC Volts 0.5 to 750 V rms ± 1.5% ± 5cts DC Amps 1 to 1000 A ± 2.5% ± 10cts DC Volts 0.2 to 1000 V ± 1% ± 2cts Resistance 0.2 to 4000Ω ± 1% ± 2cts Frequency (Current/Voltage) 20 to 10 kHz ± 0.1% ± 1ct
Jaw Opening:	1.575" (40mm)
Display	3 ¾ Digit LCD, 4000 count max
Power	9V alkaline battery
Operating Temperature	32 to 104°F (0 to 40 °C) <80% RH
Size	9.53 x 2.60 x 1.42" (242 x 66 x 36 mm)
Weight	14.10 oz (400g) with batteries

Ordering Information

Ordering Number	Description	Price
514	Clamp-On Meter	$199.00

Each unit includes: Clamp-On Meter, a pair of test leads (red/black with probe tips), Batteries, Soft carrying case & user manual.

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

Clamp-on Ground Resistance Tester

Features

- **Simple and fast clamp-on operation – no leads, auxillary rods or spacing required**
- **Direct reading of ground resistance from 0.1 Ω to 1200 Ω**
- **Direct reading of ground leakage or phase current from 1mA to 30A rms**
- **Alarms audibly & visually if reading is above or below setpoint**
- **Stores up to 99 readings for later retrieval**

The **Clamp-on Ground resistance tester** can measure ground rod and grid resistance in an environment without the use of auxiliary ground rods. Clamp-on ground resistance testers are used on multi-grounded systems with out disconnecting the ground under test. Measurement is quick and easy and up to 99 field measurements can be stored for later retrieval.

Specifications

Data	Values
Ground Resistance Measurement Range	Autoranging 0.01 to 1200 Ω
Ground or Leakage Current Measurement Range	Autoranging 1mA to 30.00A RMS
Jaw Opening:	1.38" (35mm)
Display	3 ¾ Digit LCD
Power	9V alkaline battery
Operating Temperature	14 to 131°F (-10 to 55 °C)
Size	9.25 x 3.94 x 2.17" (235 x100 x55 mm)
Weight	2.2 lbs. (1 kg)

Ordering Information

Ordering Number	Description	Price
3731	Clamp-On Ground Resistance Tester w/Alarm & Memory	$2,195.00

Each Unit Includes: Clamp-On Meter, Calibration Loop, Hard Carrying Case, 9V Alkaline Battery, & Instructions

T.O.C.

Digital Ground Resistance Tester

Features

- **Measures soil resistivity via 4-point method**
- **Measures Ground Resistance 2 & 3 point fall of potential method**
- **Auto ranging automatically selects the optimum range**
- **AC powered with Rechargeable NiMH batteries**

The **Model 4630 and 4630-Kit** are designed to be rugged, field use instruments to perform ground resistance and soil resistivity tests. These direct reading testers measure from 0 to 2000 Ω.

The model 4630 rejects high levels of interference and can be used under difficult conditions such as high stray currents.

Specifications

Data	Values
Measurement Range	Autoranging 0.00 to 2000 Ω
Accuracy	±2 % of reading ±1ct
Response Time	4 to 8 seconds for a stabilized measurement
Display	3 ½ Digit LCD
Power	120/230V 50/60Hz, Rechargeable 9.6V, 3.5 Ah NiMH batteries
Operating Temperature	14 to 131°F (-10 to 55°C), 20 to 90% RH
Size	10.8 x 9.7 x 5.0" (273 x 247 x 127 mm)
Weight	7.38 lbs. (3.35 kg)

Ordering Information

Ordering Number	Description	Price
4630	Ground Resistance Tester Model 4630 (4 point, Digital)	$1,495.00
4630-Kit	Ground Resistance Tester Model 4630 Kit	$1,995.00

Each Unit Includes: Meter, NiMH rechargeable battery, US 120V AC power cord and user manual.

Each Model 4630-Kit includes: Meter, two 300 ft color-coded leads on spools, two 100 ft color coded leads, four 16" auxiliary ground electrodes, one 16 ft lead with Mueller clip, carrying bag, one 100 ft tape measure, NiMH rechargeable battery, one AC power cord, ground workbook and user manual.

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

5000V Digital/Analog Megohmmeter

NEW

Features

- **Test insulation on cables, transformers, motors, generators, insulators and wire installations**
- **Test Voltage combinations of 500V, 1000V, 2500V, and 5000V**
- **Insulation Measurement from 30K Ω to 10 Terra Ω**
- **Dielectric Absorption Ratio (DAR) and Polarization Index (PI) tests**

The **Model 5060** is one of the only true Megohmmeters on the market. It has been specifically designed to meet the demands of the daily use of Megohmmeter in the field. The model 5060 Megohmmeter has the highest levels of safety built into the design. It is packaged in a rugged field case and has test inhibit capabilities that will not allow test voltages to be generated if a live sample is detected. The test leads, rated for 5000V for both testing and measurement are safety approved. The test terminals are recessed to ensure operating safety.

Specifications

Data	Values
Test Voltage / Range	500V 30 kΩto 2000 GΩ (2TΩ) 1000V 100 kΩ to 4000 GΩ (4TΩ) 2500V 100 kΩ to 10,000 GΩ (10TΩ) 5000V 300 kΩ to 10,000 GΩ (10TΩ)
User Selectable Test Voltage	Programmable: 40 to 1000V: 10V increments; 1000 to 5000V
Automatic Step Voltage	Programmable step voltage & duration in five steps
Accuracy	1kΩ to 40GΩ ±5 % of reading ± 3ct 40GΩ to 10TΩ ±15 % of reading ± 10ct
Voltage Test / Safety Check	0 to 1000 Vac/dc (16 to 420Hz), 1V resolution
Communication	RS232 port, Stores over 1500 test results, printer port
Display	Graphic; 320 x 240 resolution
Power	8 NiMH rechargeable batteries; Line power 85 to 256Vac (50/60Hz)
Size	10.63 x 9.84 x 7.09" (270 x 250 x 180 mm)
Weight	9.5 lbs. (4.3 kg)

Ordering Information

ALSTOM #	Description	Price
AEMC 5060	Megohmmeter 5060 Kit	$3,795.00

Each Model 5060 Unit includes: Meter, DataView software, soft accessory bag, one red, one blue and one black lead with integral 5000V rated hippo clips, one jumper lead for use with guard terminal, one 6 ft RS-232 DB9/DB25 F/F to Cable, rechargeable battery pack, US 120V power cord and user manual.

T.O.C.

10A Micro-Ohmmeter

Features

- **Measures from 0.0001m Ω to 2500.0 Ω**
- **Test Current Selection of 1mA, 10mA, 100mA, 1A, 10A**
- **Perform weld joint integrity and rail bonding checks**
- **Test winding resistance measurement of motors and transformers**
- **Stores up to 1500 test results**

The **Model 6250 10A Micro-Ohmmeter** is a rugged, low resistance tester designed for field use. Utilizing a four lead Kelvin method of testing, the model 6250 is one of the most accurate Micro-ohmmeters available.

Resistance measurements are automatically calculated and displayed taking into account the measurement value, ambient temperature, reference temperature, and metal temperature coefficient.

Specifications

Data	Values
Measurement Range	0 to 2500.0 Ω with resolution in lower ranges to 0.1 Ω
Measurement Mode	Selectable: Inductive (continuous test), Resistive (instantaneous test) or Auto (multiple tests)
Metal Type	Selectable: Copper, Aluminum or Other Metal
Accuracy	±0.05 % of reading
Communication	Stores up to 1500 test results. Data in memory can be viewed on instrument display, PC, or via direct print out
Display	Large 4 x 2.25" back lit LCD
Operating Temperature	14° to 132°F (-10° to 55°C); 10 to 80% RH
Power	Rechargeable 6V, 8.5 Ah NiMH batteries; Line power 120.240Vac 45/400Hz
Size	10.63 x 9.84 x 7.09" (270 x 250 x 180 mm)
Weight	8.1 lbs. (3.69 kg)

Ordering Information

Ordering Number	Description	Price
6250	10A Micro- Ohmmeter	$3,595.00
Optional Accessories		
1017.82	Kelvin Probes (10A) set of two, spring loaded, 10 ft	$180.00
1017.83	Kelvin Clips (1A), set of two, 10ft	$139.00
1017.84	Kelvin Clips (10A), set of two, 10ft	$199.00
2118.52	Kelvin Probes (1A), set of two, spring loaded, 20ft	$199.00
2129.95	RTD Temperature Probe (plug into faceplate for ambient temperature)	$130.00
2129.96	RTD Temperature probe with 7 ft extension cable	$228.00

Each unit includes: NiMH rechargeable 6V battery pack, set of two Kelvin clips (10A) 10 ft, US 120V power cord, carry bag and user manual.

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

Prism Inflatable Light Machine

NEW

Features

- **Innovative Technology that lights up an area of 3,600 – 12,000 sq. yards**
- **Lightweight, foldable and portable**
- **400W/1000W metal halide lamp**
- **30 seconds to inflate**
- **Easily operated by an individual**

The **Prism Inflatable Light (PIL)** is characterized by a supporting structure in synthetic fabric and an air-inflated cylinder, which raises the light source up to 15 feet high and provides excellent illumination over the area. The whole structure can be easily made to function by a single person, in conditions of complete darkness, in less than 3 minutes. It is possible to illuminate areas from 3600 to 12000 sq yards. One person can raise the PIL with metal halide lamp (400W/1000W equivalent to 32000/95000 lm of brightness) to a height of up to 15 feet, without using a metallic structure, in order to allow illumination over a vast area, in just a few seconds. A series of axial fans constantly inflate air into the supporting structure, in which sufficient pressure is generated to guarantee the necessary stability to the system, bringing the light source up to the best operative level. Ground anchorage of the structure by guy ropes allows the system to operate even with wind gusts up to 25 mph. It can be transported in the trunk of an ordinary SUV. The tower can withstand 25 -30 mph wind speed with guy ropes tied down.

Specifications

Data	Value
Weight of the towers:	PIL 400G – 40 lbs PIL 400G – 90 lbs (with gas) PIL 1000 – 55 lbs PIL 1000G – 110 lbs (with gas)
Air pressure after inflation	About 15-17mb OR 0.015 kg/cm^2
Blower Power requirement	80 Watts for each blower. (2 blowers – 160W)
Blower speed	~ 15,000 RPM after inflation
Temperature	90-100 degree centigrade (200° Fahrenheit)
Power requirements	PIL 400G –110V, 60Hz, 8 Amps, 800Watts PIL 1000G –110V, 60Hz, 10 Amps, 1400Watts
Runtime of generators	400G HONDA EU1000i – 0.6 gallons tank capacity – 3.8 hours @ rated load 1000G HONDA EU2000i – 1.1 gallons tank capacity – 4 hours @ rated load

Ordering Information

Ordering Number	Description	Price
PIL 400G	Inflatable light machine with Generator	$3,800
PIL 1000G	Inflatable light machine with Generator	$4,800

Each unit includes a generator.

T.O.C.

Frequency Selective Voltmeter Model 110

NEW

Features

- **Broad communication applications: track signaling, dedicated analog microwave or hardwired lines**
- **Quickly isolate and measure a frequency's voltage and power level**
- **Frequency range of 50Hz to 5MHz**
- **Speeds communications set-up and troubleshooting while providing the accuracy of a lab unit**

The **Model 110 FSV (Frequency Selected Voltmeter)** is a multi-purpose, portable instrument that can be used to locate interfering signals, adjusting output levels of transmitting devices, measure signal loss, tune coupling devices and measure composite signal levels. Select and analyze a single frequency on a communications line with multiple frequencies present. Instrument can be powered from AC or internal batteries and has a built in battery charger. Included software and an RS232 9-pin port provides a method to download stored readings to a computer. The computer can also be used to remotely control operation of the Model 110.

Specifications

Data	Value
Frequency Range	50 Hz to 5 MHz
Input Voltage Range	0 to 1.91 Vrms (Low level input), 0 to 100 Vrms (high level input)
Selectable Bandwidths	25 HZ, 100 Hz, 1.95 kHz, 3.1 kHz, wideband
Selectable Impedances	50, 75, 135, 600 Ω and high
Display	Five digit LCD
Oscillator	50 Ω impedance, maxium output + 12dBm, 50Hz to 5MHz, 600 Ω impedance, maximum output + 3dBm, 50Hz to 250 KHz
Memory	24 test parameter set ups with 99 measurements
Power	Operate on 85 to 264 VAC, 47 to 63 Hz or the internal batteries
Operating Range	0 - 55° C
Dimensions	9.75" W x 5.75" H x 12.875" D 16lbs

Ordering Information

Ordering Number	Description	Price
Model 110 FSV	Frequency Selective Voltmeter	$ 7,595.00

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

AmpFlex™ Flexible Current Probe, 30/300A, 24”

NEW

Features

- **Measures from 5-300 A output as 10-100 mV/A**
- **Accuracy of 1% of reading**
- **Insensitive to DC, measures only AC component on DC+AC signals**
- **Safety designed to IEC 1010 and CE mark**
- **9V Battery provides approximately 150 hours of continuous use**

The **AmpFlex™** is a flexible current probe composed of a flexible sensor and an electronic module. The flexible sensor permits measurements on conductors where standard clamp-on probes can not be used. Use it around cable bundles, wide or large bus bars, or even wrapped around irregular shapes. The AmpFlex™ presents virtually no load to the system under test, has a low phase shift and excellent frequency response and can not be damaged by current loads. It has a mV output that is proportional to the current measured for direct readings on DMMs, data loggers, oscilloscopes, power meters or harmonics meters.

Specifications

Data	Value
Frequency Range	10-20,000 Hz
Operating Temperature	-20° to 55° C
Output	¾ spaced banana jacks, 2 meter lead from sensor to module

Ordering Information

Ordering Number	Description	Price
300-24-2-10	30/300A Flexible Current Probe, 24”	$319.00

Each Unit includes: Current Probe, 9V battery and instruction manual

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Battery Management

Celltron ULTRA

NEW

Features

- **Portable IR wireless printing and data transfer to PC**
- **500 memory registers capable of storing up to 480 tests each**
- **Battery Data Manager, which included 250 battery models with established reference free testing**
- **Icon based and menu driven which allows for easy navigation and use**
- **Built-in digital multi-meter and lighted probes**

Built upon experience and proven technology, the **Celltron ULTRA** offers advanced battery testing capabilities for effective evaluation and maintenance of uninterruptible power supplies. Batteries have been demonstrated to be the "weakest-link" in most UPS systems, and historic methods for evaluation have been cumbersome, confusing and inconclusive.

The Celltron ULTRA combines advanced conductance technology, state-of-the-art portable electronics and convenient data management to facilitate fast, simple, safe and accurate battery management. The Celltron ULTRA includes many key new features that meet both the reporting needs of management and the simplicity and accuracy demanded by technicians.

Specifications

Data	Value
Voltage	1.5 - 20.0 Volts DC
Conductance	100 - 9,990 Siemens
Power	9V, 1600mAH< internal swappable charger
Tester Weight	2.6 lbs.
Shipping Weight	11 lbs.
Housing Material	Acid resistant ABS plastic
Case Dimensions	19" x 15.5" x 7", 485 mm x 395 mm x 180 mm

Ordering Information

Ordering Number	Description	Price
CTU-6000	Celltron ULTRA	$5,590.00
CTU-6000 Kit	CTU-6000 Kit (hard case, extended probes, printer, and other accessories)	Call

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

Absolyte IIP Single Cells

Features

- **Proven field experience since 1983**
- **Low resistance of the Absorbed Glass Mat (AGM) Technology improves discharge performance**
- **Cells are housed in protective, individual steel trays with convenient lifting handles for easy transport to remote locations**
- **Single cell design may be operated in the horizontal or vertical position**
- **Designed for a 20-year life expectancy at 25°C**
- **No water additions or scheduled equalization charges are required**
- **Patented MFX positive grid alloy provides 1200 cycle to 80% depth of discharge**
- **Operating temperatures range between -40°C to +50°C**
- **Product will recover from deep discharges**

The **Absolyte IIP** is the number one battery for signal applications in the US. It has proven performance for 20 years in both AC and photovoltaic charging applications. It is the safest, most reliable and lowest maintenance battery on the market today. The model IIP does not required a separate battery room; has a transparent, flame retardant module cover; is tolerant to freezing; accepts high rate charge; meets U.B.C. Seismic Zone IV requirements and is recyclable to world standards.

Specifications and Ordering Information

Cell	Average Hour Cap (8hr)	Weight (lbs)	Length (in)	Width (in)	Depth (in)	Price
50A05	104	32	3.80	6.49	16.00	$262.00
50A07	152	39	3.80	6.49	16.00	$310.00
50A11	264	50	4.55	6.49	16.00	$418.00
50A13	312	58	5.30	6.49	16.00	$468.00
50A15	368	66	6.05	6.55	16.00	$518.00
50A19	472	91	7.67	6.67	16.00	$666.00
50A27	680	124	10.67	6.67	16.00	$886.00

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Battery Management

Celltron Advanced

Features

- **Portable IR wireless printing & data transfer to PC**
- **16 internal memory registers capable of storing 480 tests each**
- **Over 250 battery model #'s with established reference/benchmark values**
- **On-line testing of individual cells or 12 volt mono-blocks**
- **Voltage logging only option and quick retest feature**
- **Infrared printing technology**

The **Celltron Advanced** is the ultimate tool for stationary battery management. Research proven technology and fieldtested design make it a must for critical power maintenance. This analyzer measures individual cell and overall string health and voltage. Using a menu driven test sequence provides the user with consistent, repeatable on-line testing without discharge to the batteries. The portable IR wireless printing and data transfer to PC makes the CTA-2000 efficient and easy to use. The user is also afforded definable battery reference number storage and fault thresholds. The meter also comes in a field ready kit CTA-4000. The kit includes the CTA-2000 meter, protective boot, rechargeable battery pack, infrared PC data receiver & software, infrared printer,infrared temperature sensor, hard shell protective carry case, both clamp and probe cables, probe tips, spare fuses, printer paper, 9 volt batteries.

Specifications

Data	Value
Voltage	1.0 - 15.0 Volts DC
Conductance	100 - 9,990 Siemens
Tester Weight	1 lb / 4539, CTA-4000 Test
Shipping Weight	9.5 lb/4 kg
Housing Material	Acid resistant ABS plastic
Case Dimensions	19" x 15.5" x 5", 750 mm x 610 mm
Power	9V high capacity/heavy duty lithium battery or rechargeable battery pack

Ordering Information

Ordering Number	Description	Price
CTA-4000	Celltron Advanced - Kit	$4,995.00
CTA-2000	Celltron Advanced - Meter	Call

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Battery Management
Celltron Essential

Features

- **Measures the batteries' State of Health**
- **On-line, quick, simple, safe and accurate operation**
- **Stores up to 480 test results**
- **Outputs include voltage, MHOS (conductivity) and a percent of reference**

A stationary battery string analyzer, the **Celltron Essential** provides the key test features used for outside plant applications and makes it easier to perform quick battery maintenance. The Celltron Essential is proactive, providing advanced warning of potential battery failures. It can also test each cell in under 10 seconds and an entire string of batteries in just minutes. This product helps prioritize battery replacements for more cost-effective system management and is versatile in that it tests both battery cell and intercell strap integrity without needing an external power source.

Specifications

Data	Value
Voltage	1.0 - 15.0 Volts DC
Conductance	100 - 9,999 SiemensPower
Power	9-volt high capacity lithium battery
Operating Range	0 to +40°C, 95% relative humidity, non-condensing
Accuracy	+2% across test range
Housing	Material Acid resistant ABS plastic
Tester Dimensions	9" x 4" x 2.5", 230 mm x 102 mm x 65 mm
Case Dimensions	19" x 15.5" x 5", 750 mm x 610 mm x 200 mm
Each unit includes	Protective carrying case, probe cables, probe tips, spare fuses, 9-volt battery

Ordering Information

Ordering Number	Description	Price
CTE-1000	Celltron Essential with Probes in a Soft Case	$2,495.00

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Solid State Code Transmitter Relay

Features

- **Direct replacement of ALSTOM electromechanical code transmitter relays**
- **Lower Life Cycle Cost: No mechanical adjustments or periodic inspections needed**
- **Vital microprocessor based design**
- **Internal or External rate selection**
- **Built-in diagnostics**
- **Available in low and high voltage versions**

ALSTOM's **Solid State Code Transmitter Relay** (SSCT) is a vital code rate transmitter that combines microprocessor technology with vital software and circuits to achieve an outstanding level of safety and reliability coupled with a maintenance-free design. The SSCT is capable of generating seven commonly used code rates, thereby reducing the number of types of units a user needs to stock. The SSCT design is based on the premise that any component degradation or failure (hardware and/or software) will not produce a code rate other than the rate selected. Should the unit detect a failure, or the input power drop below the minimum requirements, code rate generation is halted and the unit is reset. A minimum of two-second vital delay period follows every reset so that a sequence of starting and resetting does not appear as a valid code rate. A LED indicates when the unit is executing the two-second delay. SSCT is available in two rate configurations, fixed or universal. In the fixed configuration, the unit generates a single rate. In the universal configuration, when not installed, the transmitter is in a "non programmed" state. To select a code rate, a single wire jumper is added to the wiring side of the B2 plugboard. When the unit is installed, it becomes "programmed" by the jumper to generate one of the rates. A light-emitting diode (LED) indicated at which rate the generator is operating. The SSCT is powered from a DC supply, the allowable input voltage can range from 8 VDC to 16 VDC. At the nominal 12 VDC input the unit draws .30 ampere. The unit is protected from damage by the application of reverse voltage. Four solid state circuits emulate the contacts of the mechanical code transmitter. A LED indicates which set of contacts is closed at any given time. The output circuits ("contacts") are available in two configurations, low voltage or high voltage.

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Configurations

The **SSCT** is available in 16 separate configurations. A unique part number designates each configuration. The group number defines the method of rate selection (fixed or externally selected), the rates available for that configuration, and whether the output circuits are designed for low voltage or high voltage operation.

P/N	Rate	Low Voltage	High Voltage	Replaces These CT Relays
31750-100-01	EXT*	x		None
31750-100-02	EXT*		x	None
31750-100-03	50 Fixed	x		57490-121-01
31750-100-04	50 Fixed		x	57490-122-01
31750-100-05	75 Fixed	x		57490-080-01, -10 and (57490-095-01, -05 different registration)
31750-100-06	75 Fixed		x	57490-091-05,-06 and (57490-080-02 different registration)
31750-100-07	96 Fixed	x		57490-080-07, -09
31750-100-08	96 Fixed		x	57490–080-08
31750-100-09	120 Fixed	x		57490-096-01, -04
31750-100-10	120 Fixed		x	57490-092-01
31750-100-11	180 Fixed	x		57490-097-01, -04
31750-100-12	180 Fixed		x	57490-093-01
31750-100-13	220 Fixed	x		57490-119-01, -02 (Relay Only Had 1F-1B)
31750-100-14	220 Fixed		x	57490-111-01 (Relay Only Had 1F-1B)
31750-100-15	270 Fixed	x		57490-098-01
31750-100-16	270 Fixed		x	57490-094-01

*50, 75, 96,120, 180, 220, 270 rate externally selected with a plugboard jumper

Specifications

Data	Value
Code rate accuracy	± 2% stability with temperature and power supply variations is better than ± 0.1%
Operating temperature range	-40°C to +70°C
Rate configurations	Fixed or universal
Code rates	50, 75, 96, 120, 180, 220 or 270
Power	DC supply, 8 VDC to 16 VDC
Solid State Output Circuits 2F and 2B	Low voltage (42 VDC @ 5.6ADC/30VRMS @4ARMS) or high voltage (220 VDC @ 2 ADC/220VRMS @ 2 ARMS)

Ordering Information

For assistance in ordering and specification of the ALSTOM Solid State Code Transmitter, please contact the ALSTOM Customer Service Center at 800-717-4477

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Non-Vital Relays

*J Relay Replacement**

Features

- **Easy to maintain – no wires need to be disconnected or hardware removed for inspection or replacement**
- **Resistant to impact and vibration**
- **Positive mechanical keying**
- **Double break safety contacts standard**
- **Available as a timing relay (From 0.25 Sec. to 63.75 Min.)**
- **Available in a variety of voltages (12 VDC, 24 VDC, 115 VDC, 12 VAC, 127 VAC)**

Specifications

Data	Value
Operating Temperature	Range -40°C to 80°C
Contact Life	100 Million Cycles
Weight	15.87 Ounces
Dimensions	6.34" (16.10 cm), Long X 2.17", (5.51 cm) Wide (Including Locking Studs)
Vibration	Tested in the X, Y & Z, Planes at frequency between 10 & 150 Cycles (Sinusoidal) at 2 G
Shock	Tested in Both Directions in the X, Y & Z Planes. Three successive shocks consisting of the positive component of sinusoidal with a value of 30 G, 18ms
Humidity	93% RH, 40°C for 4 Days
Salt Mist	5% NaCl, 35° for 4 Days

Ordering Information

Nominal	Operating Voltage	Resistance (Ohms) +8% Range	Contact Resistance Ohms	Contact Resistance Ohms (Max.) at (Max.) at 10A	Contact Material 5A Voltage	Ordering Number	Price
24 VDC	16-33	170		0.020	Gold Plate	36450-298-00	$249.00
24 VDC	16-33	170	0.010		Silver	36450-299-00	$149.00
12 VDC	8-16	40		0.020	Gold Plate	36450-300-00	$249.00
12 VDC	8-16	40	0.010		Silver	36450-301-00	$149.00
115 VDC	77-144	4000		0.020	Gold Plate	36450-302-00	$249.00
127 VAC	88-143 AC	4000		0.020	Gold Plate	36450-303-00	$359.00
12 VAC	8-16 VAC	40		0.020	Gold Plate	36450-308-00	$359.00

Note: (*) ALSTOM's new Non-Vital Relays replace the Type J Non-Vital Relays but are not plug in replacements. ALSTOM can rebuild or repair your existing Type J relays in our Service & Repair facility subject to parts availability. For more information, contact Customer Service at 800-717-4477

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Non-Vital Time Delay Relays

NEW

The **Time Delay Relays** are programmed by setting the 10 dipswitches. Dipswitches 1 to 9 are set in the ON or OFF position. The final time delay is the sum of each individual dipswitch setting values (1 to 8) multiplied by the value of dipswitch 9. Dipswitch 10 selects the action to pull-in or drop-out. The dipswitches are accessed by removing the relay's cover.

Specifications - Electrical

Data	Values
Action	Nominal Load Current: 12 Amps Instantaneous Contact Changeover With Contact Wiping Action in Both Positions
Dielectric Strength	2000 VAC for 1 Minute Between Contacts, 2600 VAC for 1 Minute Between Contacts, Coil and Frame
Insulation Resistance	> 1000 Megohms at 500 VDC
Coil Overvoltage Protection	MOV 100Z15 – Protection Across Coil

General Contact Data - Silver

Data	Values
Nominal Current	12 Amps (Silver Contacts, Resistive Load)
Contact Closure Time	NO: <55ms Pick-up NC: <25ms Drop-out
Contact Opening Time	NC: <50ms Pick-up NO: <15ms Drop-out
Minimum Contact Continuity	20 mA at 24 VDC
Number of Contacts	4 Changeover Double Break Contacts (Form Z)
Contact Material	Hard Silver Overlay Laminated to Copper

General Contact Data - Gold

Data	Values
Max. Contact Ratings	Operating: 20 mA Max. at 72 VDC, Carry Only (Not Make or Break): 5 Amp Max. at 5 VDC
Contact Resistance	< 20 Milliohms at 5 Amps (Carry Only)
Contact Material	Stationary Contact – Gold Plate Over Hard Silver, Movable Contact – Gold Plate Over Hard Silver Overlay Laminated to Copper

Ordering Information (Time Delay Relays)

Nominal Voltage	Operating Voltage Range	Nom. Power (Watts)	Contact Resistance Ohms (Max.) at 5A	Contact Material	Ordering Number	Price
12 VDC	8-16	3.5	0.020	Gold Plate	36450-304-00	$329.00
24 VDC	16-33	3.5	0.020	Gold Plate	36450-305-00	$329.00

Note: When applying relays with silver contacts, the minimum power through contacts must be 0.48 W (e.g. 20 ma/24 V, 10 ma/48 V) and the contacts must operate at least one time per day. For applications not meeting these minimum requirements, relays with Gold contacts must be used.

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Relay Monitor

NEW

B1 Relay

Relay Monitor

Features

- **Simple and quick to install**
- **DIN mounted, Non-Contact Current Measurement**
- **Assess the condition of relays looking for an event or change in the relay condition**
- **Early warning of defective (intermittent or not) relay before problems or critical breakdown occur**

High sensitivity (mA) transducers used to provide non-contact measurement of relay currents. Hundreds of relays are used in railway signaling and switch machine systems to control the integrity of the system. The **Model RCM** connected to a data logger can store data coming from the relay 24 hours a day and record intermittent faults. This allows the maintainer to trace the exact location of the problem and repair or replace just the defective relay in a timely manner, avoiding replacement of the complete relay set.

Specifications

Data	Value
Operating temperature range	-25°C to +85°C
Excellent accuracy	
Able to measure	1mA
I nominal	2ADC

Ordering Information

Ordering Number	Description	Price
RCM 2A-VI/SP1	Analog voltage output 2V@Ip=2A	$372.50

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Switch Points Monitor

NEW

Features

- **Waterproof railway points monitoring current transducer provide early warning of machine failure before problems or critical break down occurs**
- **Simple and quick to install**
- **Open Clip, Non-Contact Current Measurement**
- **Assess the condition of key components such as switch machine actuation current**

Perform preventative maintenance, using this new transducer that measures the DC current taken by the switch machines motor without disrupting the existing electrical connections. The measurements are then stored in a data logger for later comparison. If the machine exhibits different measurements at a later time, these could indicate an additional load on the motor. That could indicate mechanical wear, lack of lubrication, jamming within the points by ballast, electrical motor or winding failure, or points misalignment.

Specifications

Data	Value
Design (opening core)	Clip on
Power supply	Unipolar 0 to +24 Volts
Accurate bipolar DC or AC (up to 1 kHz)	5A RMS,10A RMS, 20A RMS, 30A RMS nominal measurement
Measured peak current	Up to 2 x I nominal, with an output of 4 - 20mA

Ordering Information

Ordering Number	Description	Price
PCM 10-P	PointSenz for standard Panel mounting	$291.20
PCM10-P/SP1	For Standard Panel mounting with 2m cable output not waterproof	$283.10
PCM 5-PR/SP2	For Standard Panel mounting 5A RMS nominal with	$312.90

For assistance in ordering and specification of Switch Points Monitor, please contact the ALSTOM Customer Service Center at 800-717-4477

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Cycle Counter

Features

- **For use primarily on Switch Machines**
- **Maintenance Planning Tool**
- **Installed in-line with the correspondence relay in the instrument house**
- **Key-protect switch to prevent front resetting**
- **Eight-digits, counting range 0 to 99999999**
- **Selectable input speed: 30 Hz or 1 kHz (except for AC/DC multvoltage input models)**
- **Waterproof packing, flush mounting bracket**
- **Large display with 8.6 mm (0.338 in) height**

The **Omron Cycle Counter** is a battery operated counter accessory available to keep track of switch machine use and to act as a maintenance-planning tool for many other signaling products. The Cycle Counter can be installed in-line with the correspondence Relay in the Instrument House. An important advantage of the Cycle Counter method is its long term reliability and low maintenance requirements.

Specifications

Data	Value
Dimensions	.94" h x 1.89" w x 1.91" d
Battery Life	7 Years minimum with continuous input at 25 ° C (lithium battery)
Operating Temperature	-10° C to 55° C
Storage Temperature	-25° C to 65 ° C
Weight	Approximately 60g
Max Counting Speed	30Hz / 1kHz (Selectable)
Insulation Resistance	100M _ min. (at 500 VDC)
Count/Reset Input	No Voltage input, external reset and manual reset: Minimum signal width of 20 ms

Ordering Information

Ordering Number	Description	Price
26674-025-00	Cycle Counter	$99.00

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Load Sensing Kit

NEW

Features

- **Safer Switch Installation**
- **Precision Load Sensing**
- **Easy Installation**
- **Rugged – High Strength Stainless Steel**
- **Direct Force Measurement**
- **Internally Sealed Strain Gauges**

The **Switch Machine and Switch Layout Load Sensing Kit** measures load applied to a switch throw rod. It can be used to accurately measure and adjust point pressure at each individual point, allowing for safer switch layout adjustment. It is ideal for new switch machine installations and regular maintenance. Troubleshooting switch layouts and switch machines is made easier when you can make actual force measurements.

Specifications

Data	Value
Operating Time	5-10 hours continuous use depending on transducer resistance
Case Size (inches)	5" x 7½" x 2"
Weight	2.5lbs
Display Size	½" inch LCD
Calibration Check	Preset to approximately 80% FS

Ordering Information

Ordering Number	Description	Price
59649-218-00	Switch Machine/Switch Layout Load Sensing Kit	$4,995.00

Each Load Sensing Kit includes: Clevis Pin - 5000 psi, 1.65 MV/V, 350 Ω, Keeper plate with hardware, Interconnecting cable assembly (10 feet), 6 pin straight connectors, 4 cond. cable, Portable load indicator 3½" digit display, ± 1 count, and Rechargeble batteries (Nickel Cadmium) and charger.

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HWU41 and HWU161
Embedded Switch Machines

NEW

Features

- **Throw-Over or Spring-Back function**
- **With or without Tongue Detection**
- **Manual Point Setting Machine**
- **Trailable**
- **Extremely low height of 180 mm**
- **Option diagnostic system**
- **Easy installation and adjustment**
- **Adjustable end position damping**
- **Tongue end position monitoring**

The new manual point setting mechanism **HWU 41** is suitable for flat-bed and deep-bed points with a point opening of up to 70 mm. Point tongues are held in their end positions by redundant springs. In spite of the high spring forces which can be set progressively up to 4000 N, setting is possible with just one stroke of a manual lever with low force requirement.

The new **HWU 161** manual point setting mechanism has a height of 165 mm and can be deployed in flat-bottomed rail area without modification of the existing rail ties. With a tongue opening of up to 160 mm, the HWU 161 can be installed beside the track or between the rails.

Specifications

Data	Values
Type of points	Flat and deep-bed (grooved rail), flat-bottomed and special point constructions
Gauge	For all gauges
Point openings HWU41	In throw-over function (trailable): 30 to 70mm (1 1/8" to 2 3/4") In spring-back function: 30 to 70 mm (1 1/8" to 2 3/4")
Point openings HWU161	In throw-over function (trailable): 71 to160 mm, In spring-back function: 71 to 100 mm
Installation	In the point, in the center, or on the left or right of the tracks
Holding force of drive springs	Can be set progressively up to 4000 N
Torque for manual setting	< 400 Nm (with 1m setting lever max. 400 N)
Installation height	165 mm (6.5") with earth case
Optional	Adjustable end position damping, tongue end position monitoring, insulated installation Adapter frame for other earth cases, electrohydraulic and electromagnetic drive Measurement of the tongue position and the force on the point tongues with a diagnosis module

Ordering Information

For assistance in ordering or requesting further information on the HWU 41 or HWU 161 switch machines, please contact the ALSTOM Customer Service Center 1-800-717-4477

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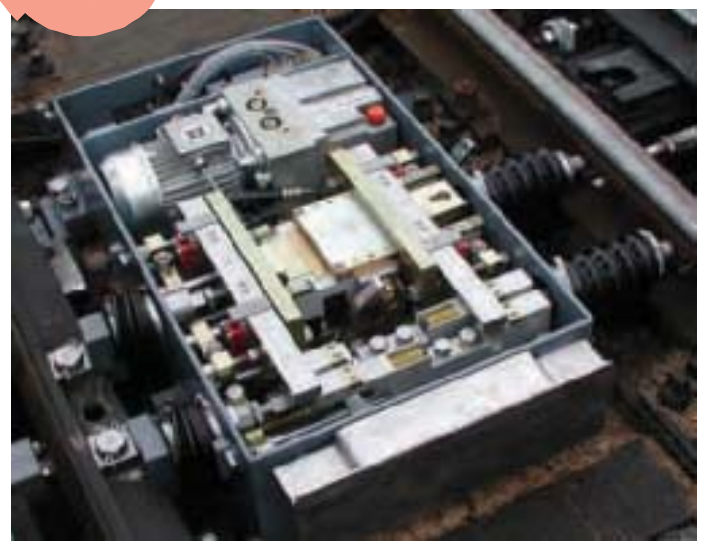
HW(E)61
Embedded Switch Machines

NEW

Features

- **Magnetic or Electrohydraulic drive**
- **With or without Positive Locking**
- **With or without Tongue Detection**
- **Trailable or Non-trailable Version**
- **Option integrated heating elements**
- **Option diagnostic system**
- **Easy installation and adjustment**



The **HW(E) 61** point setting mechanism with locking device is certified according to DIN V 19250 and DIN V19251, safety requirements category AK 6 and AK 7. It can be deployed in many different types of points (flatbed, deep bed and flat-bottomed). In grooved rail areas, the HW(E) 61 setting mechanism is placed in an earth case which can be driven over by heavy traffic. In flat-bottomed rail segments, the HW(E) 61 is screwed directly to the foot of the rail with a rail foot attachment.

Specifications

Data	Values
Point opening	32 to 100 mm [1.25 to 4.00 inch]
Burst-open force of the open point tongue	7000 N [1573 pounds]
Force applied by the packet of springs	min 1000 N [224 pounds], progressively adjustable up to 3500 N [786 pounds]
Force moment required for manual setting	< 400 Nm [3540 pound inch]
Setting force: approx. 5000 N [1124 pounds]	Double acting magnet: DC 500 V ... 900 V, AC 115 V / 208 V + 10%, -15% (3-ph), AC 120 V + 10%, -15% (1-ph)
Protection class of point setting mechanism housing (provided device is installed and maintained properly)	EU: IP 67 (EN 60529) USA: NEMA Type 6 (250-1997)
Weight of point setting mechanism	Approx. 500 kg [1102 pounds] (1000 mm [39.3 inch]gauge) Approx. 700 kg [1543 pounds] (1435 mm [56.4 inch] gauge)
Weight of earth case cover	50 to 90 kg [110 to 198 pounds]
Safety requirements category	Category AK 6 safety requirements, Category AK 7 safety requirements
Ambient temperature	-25 to +50°C [-13 to 122°F]

Ordering Information

For assistance in ordering or requesting further information on the HW(E) 61 switch machine, please contact the ALSTOM Customer Service Center 1-800-717-4477

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SPECTROM L
Signals

NEW

Features

- **LEXAN™ - Breakthrough Technology in Plastic Housings allow for efficient applications in ANY environment**
- **Low Power Consumption and Long Life LED's**
- **Superior impact properties - ductile from -50 degrees C and above**
- **Versatile Mounting and Positioning; 3 to 10 Lamp Positions**
- **Convenient Side Access to Terminations**
- **Ideal for Narrow Tunnel Applications**
- **Easy change out led modules**

The **Spectrom L** line of housings for switch-position indicators and transit/railroad signals are designed to withstand the harshest environmental conditions. Manufactured from Lexan™, a tough, long-life polycarbonate-siloxane copolymer sheet and resin, the housings are corrosion and U.V. resistant, non-conductive, and are designed to withstand flying debris from tracks. Housings for switch-position indicators can be pole mounted, while those for transit signals can be pole-, ground-, or wall-mounted. Spectrom L railroad signal housings, which are available in standard sizes and shapes in many configurations, are able to adapt to industry standard mounting hardware. Five-inch and eight-inch LED modules are used in transit and freight applications, respectively.

Specifications

Data	Value
Operating Temperature	-50° C and above
Weight	15 lbs. (3 aspect)
Dimensions	28"h x 14"d x 6" w (3 aspect)

Ordering Information

For assistance in ordering and specification of the ALSTOM Spectrom L, please contact the ALSTOM Customer Service Center at 800-717-4477

Note: Units may be purchased with any of 5½" retrofit lamp LED's listed in our signal section on page.
Lexan™ is a trademark of the General Electric Company

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Spectrom L
Switch Position Indicator

NEW

Features

- **Functions as a multi-purpose signal, route indicator or switch position indicator with normal or bi-directional aspects**
- **Uses Industry Standard 5” LED Modules**
- **Engineered Plastic Housing**
- **Pole Mounted**
- **Modular Design**
- **Side Access to Terminations**
- **Easy change out led modules**

Lexan™ Features

- **Highest Flammability Rating (UL94-5VA)**
- **Excellent UV Protection (UL94 f1 rated)**
- **Superior impact properties (ductile from -50° and above)**
- **Low smoke properties (meets ASTM E662)**
- **ECO conforming (no bromine, chlorine or other halogens)**

The **Spectrom L Switch Position Indicator** is comprised of a 4 aspect housing with configurable lamp arrangements. Typically a green aspect is displayed to indicate that the switch machine is lying in the normal position and yellow indicates reverse. The signal is easily configurable and blanking plates are used to cover unused positions when necessary. The Switch Position indicator is pole mounted with accessible terminations through the secure side panel.

Ordering Information

For assistance in ordering and specification of the Switch Position Indicator please contact the ALSTOM Customer Service Center at 800-717-4477

Note: Units may be purchased with any of 5½” retrofit lamp LED’s listed in our signal section on page.
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ALSTOM

As freight railroads take on the challenge of building infrastructure to meet the burgeoning transportation needs of the global marketplace, ALSTOM steps up to the plate with train supervisory solutions that emphasize operational benefits of improved safety, added capacity and fuel conservation.

ALSTOM'S OTMS™ (Optimized Train Management System) not only delivers a "bigger picture" to help dispatchers make the most efficient and cost-effective decisions, it can also provide train crews with their own real-time "bigger picture" of their rail system.

OTMS™ provides a modular architecture that permits the addition of specialized functions for advanced scheduling, dark territory control, traffic planning and optimization plus many other applications; capabilities beyond traditionally offered dispatch systems. Through the use of computers operating on wide- or local-area networks, critical real time information is brought to the office and on-board instantaneously – from switch positions to work zones locations and movement authorities.

And like the speed of information it provides, OTMS™ payback is quick too. For example, a current ALSTOM customer applying OTMS™ over 6,000 miles of track, is projecting an increase in tonnage moved per unit of time with a breakeven in just 18 to 24 months. That makes the picture very clear.

ALSTOM is here to assist operators and owners with urban, intercity and freight rail systems. Let's talk about how we can serve you.

A global leader in power and rail infrastructure

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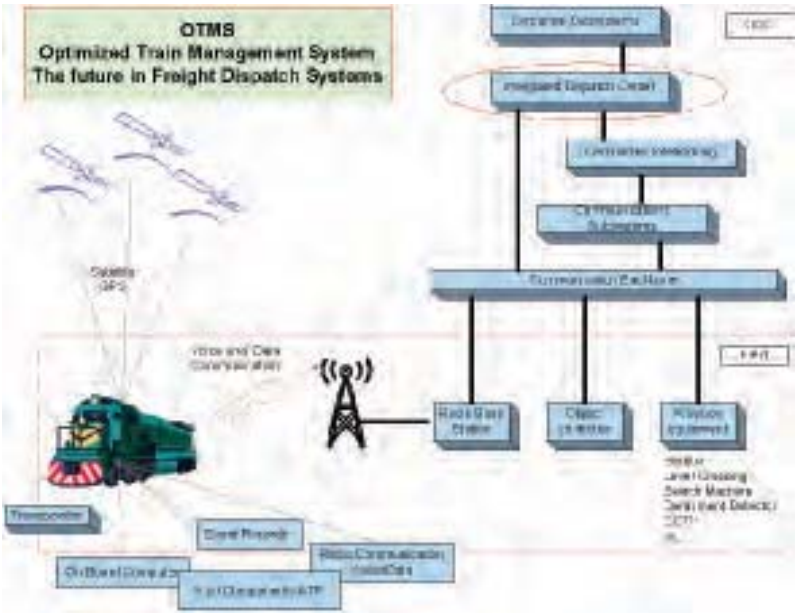
OTMS
OPTIMIZED TRAIN MANAGEMENT SYSTEM

NEW

Features

- **Improved Asset Velocity**
- **More Efficient Resource Utilization**
- **Increased Fuel Efficiency**
- **Automatic Train Dispatch**
- **On Board Computer Management**
- **Conflict Detection/Solving**
- **Train Movement Forecast**



Through the new **Optimized Train Management System (OTMS)** ALSTOM provides a comprehensive solution, which is backed by a genuine commitment to customer support. The solution provides overall Train Management System Functionality, including Signaling Equipment and Monitoring, an Integrated Communications Center (ICONIS), On-Board Computer Technology, Planning and Optimization Tools and Data Radio Communication equipment. There exists decades of evidence to indicate that ALSTOM has consistently provided top of the line Train Management solutions for the North America Railroad Market. ALSTOM's commitment to offering this comprehensive Optimized Train Management System is second to none. ALSTOM's introduction of communication systems into the new Optimized Train Management System (OTMS) is an innovative approach to an already advanced Train Management Solution. Communication between the Integrated Control Center and the On Board Computer provides an efficient, insightful look at on board operations in order to optimize train performance. Instantaneous communication and data flow will give the Integrated Control Center enhanced capabilities such as forecasting train movement and conflict detection/solving.

Ordering Information

For assistance in ordering and specification on the Optimized Train Management System, please contact the ALSTOM Customer Service Center at 800-717-4477

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AGATE™ e-Media

NEW

Features

- **Advanced, highly customizable, scalable, upgradeable solution that is fully integrated and multi-modal**
- **Fully able to be integrated within other ALSTOM Signaling product lines**
- **"Train-Ground Communication" system, providing two-way wireless communication between vehicle and stations or control centers**
- **Can operate in a variety of mass transit environments, including metro/light rail, commuter rail, freight rail, inter- city trains, buses and trams**
- **Reduce operator equipment quantity, space, cabling, installation and maintenance costs**

Real-Time Travel Information, Security and Entertainment Solutions

AGATE™ e-Media, by ALSTOM Transport Montreal, is an advanced, highly customizable, scalable, upgradeable solution that is fully integrated to provide real-time passenger information, entertainment and security. AGATE™ e-Media solutions can operate in a variety of mass transit environments, including metro/light rail, commuter rail, freight rail, inter-city trains, buses and trams. They are fully integrated with other ALSTOM signaling product lines. Each solution can be implemented on its own or fully integrated with the other components over a wide area network. Operators can equip their entire system or start with a limited number of strategic trains or stations and expand later.

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ALSTOM AGATE™ e-Media

AGATE™ e-Media Solutions Include:

Public Address (PA) system, which delivers audio communications on board transit vehicles. Real-time announcements from drivers and crew to passengers, automatically or manually triggered pre-recorded digital voice announcements, intercom communications between passengers and crew, and additional functions like background music, signaling and at-seat audio are possible.

Real-Time Travel Information system, which includes the Passenger Information system and the Infotainment system.

The Passenger Information system is responsible for visual information to onboard passengers. It provides automatic visual station and connection announcements synchronized with audio, broadcasts priority messages to passengers in the event of service disruptions or emergencies and identifies vehicle numbers and destinations to passengers on stations.

The Infotainment system provides commuters with information and entertainment. It broadcasts real-time information, emergency messages and entertainment such as news, advertisements, local attractions and movies. It also provides personalized entertainment including audio on demand as well as Internet and/or Intranet access. Content is updated via a wireless network. The Infotainment system can generate new revenue for transit operators through the sale of advertising.

AGATE™ e-Media also offers a **Train-Ground Communication system**, which provides two-way wireless communication between vehicle and stations or control centers. For example, it manages the exchange of voice, CCTV images and data, for updating the infotainment content and streaming onboard CCTV images to a ground security center.

AGATE™ e-Media integrated trainborne CCTV, PA, Real-Time Travel Information and Train-Ground Communication systems use a single high-speed Ethernet backbone. The fact that our systems are integrated and use the same infrastructure reduce operator equipment quantity, space, cabling, installation and maintenance costs: hardware and material costs can decrease by 10-30 %, and all systems can communicate to each other with a faster response time.

T.O.C.

AGATE™ e-Media
CCTV System

NEW

Features

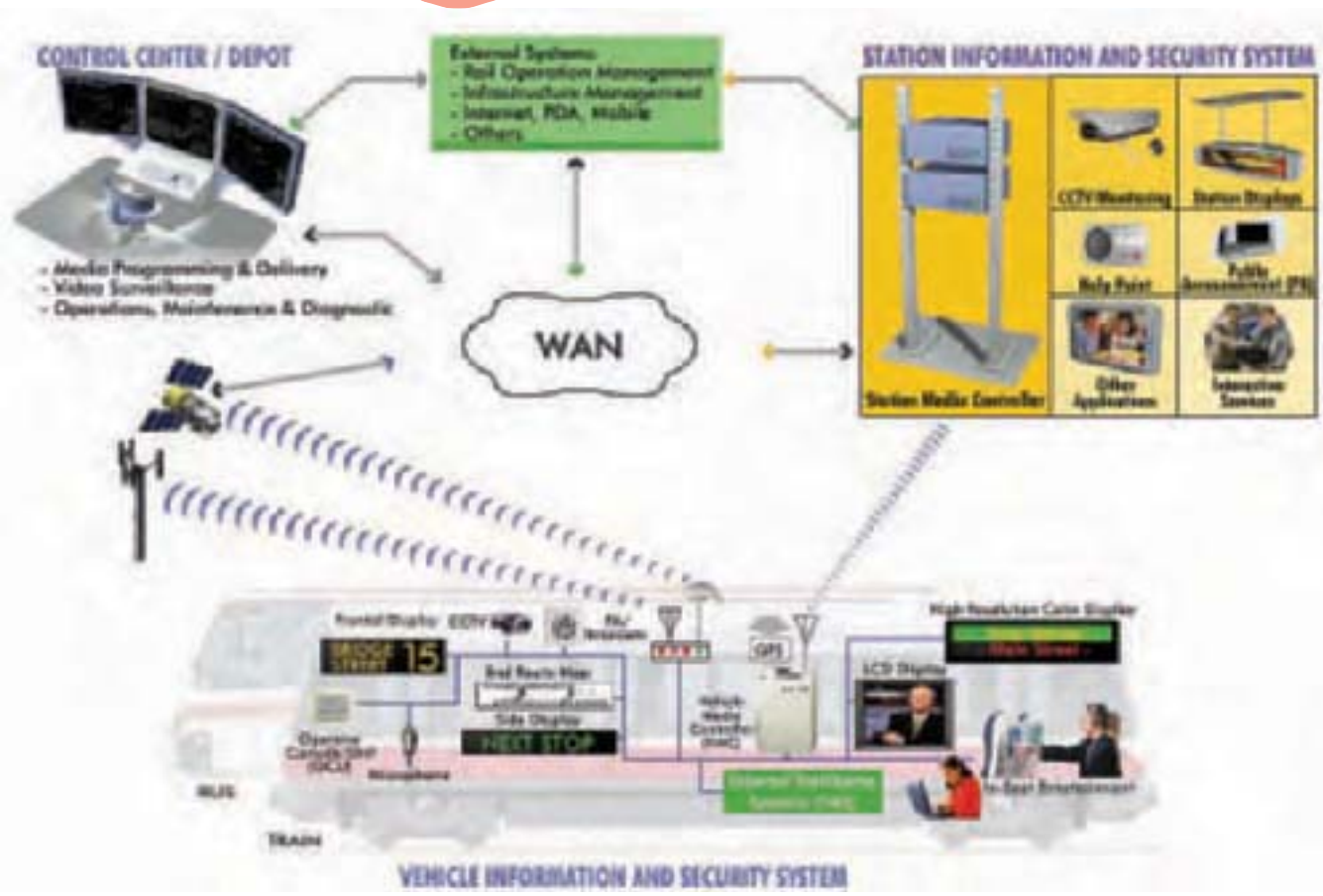
- Provides on board and wayside video surveillance such as crossings remote surveillance
- Driver can select camera or car to view, trigger an alarm, watch two video streams at once, change views and more
- Uses efficient, configurable compression techniques and supports a variety of image formats
- Records several video streams at once on removable hard disks
- Records date, time, location and other information on video streams to prevent tampering
- Can record at a higher frame rate when a passenger activates an alarm
- Cameras, controller and operator console unit can also be used for retro vision purposes
- Offers configurable video bit rates, frame rates, resolution
- Recording can be continuous or looped, and last from one hour to 30 days
- Conforms to North American and European safety standards

Ordering Information

For assistance in ordering or requesting further information on the ALSTOM Agate™ e-Media, please contact the ALSTOM Customer Service Center 1-800-717-4477

T.O.C.

AGATE™ e-Media CCTV System



AGATE™ e-Media complete solution (pages 34 to 37)

AGATE™ e-Media CCTV System Include:

Safety and Security Closed-Circuit Television (CCTV) system, which is responsible for video surveillance onboard vehicles and in wayside areas. It streams images to the onboard operator console unit or ground stations, stores images and audio on removable hard disk, protects the integrity of the information for legal use and allows for viewing of real-time or archived images.

The AGATE e-Media CCTV system takes over the task of surveillance, freeing up security personnel for more complex functions. The system was developed specifically for use in transportation, so it is ideally suited for applications both in vehicles, in stations, along the tracks at strategic points etc. AGATE e-Media CCTV system is modular, scalable and uses industry-leading codecs for high-quality images.

On board products: - *Analog or digital cameras* (high resolution, rail-grade cameras for full coverage of the vehicle's interior and door area) - *Digital Video Recorder* (DVR, takes images from analog cameras and stores them on a hard disk) - *Network Video Recorder* (NVR, takes video from digital cameras, and stores them to a hard disk) - *Operator Console Unit* (OCU is a touch-screen computer for managing the CCTV and for viewing real-time images from the train cameras).

Wayside products: - *Outdoor wireless cameras* (for monitoring tracks, tunnels, bridges, depots and crossings, essentially any wayside area that presents potential security concerns) - *Remote video surveillance workstation* (for remote video surveillance of driverless trains, crossings, tracks, tunnels, bridges, depots etc.)

T.O.C.

Wireless Communication Solutions

Software Defined Radio

Features

- **Improved safety**
- **Open & Nonproprietary interface architecture**
- **Monitor position and status of all assets**
- **Real-time 2-way communications**
- **Low cost infrastructure build-out**
- **Interface with legacy systems**
- **Integrate with all existing RF networks at the RF level**
- **Peer-to-Peer communications**
- **Works in “Dark Territory” with Solar panels**
- **Extended line-of-sight (ELOS) coverage**
- **Programmable, configurable, standardized Radio units**

Packet Data Radio

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

Applications

ETMS(Computer Based Train Control)
The network provides the means to deliver track warrants and other message traffic between the locomotive's on-board train management system and Dispatch. The MeteorComm Radio, located on the locomotive, automatically reports position and speed to the NOC every15 seconds. It also communicates with wayside devices and automatically commands approaching control points to report signal aspect, switch status and other related information for delivery to the locomotive's on-board computer.

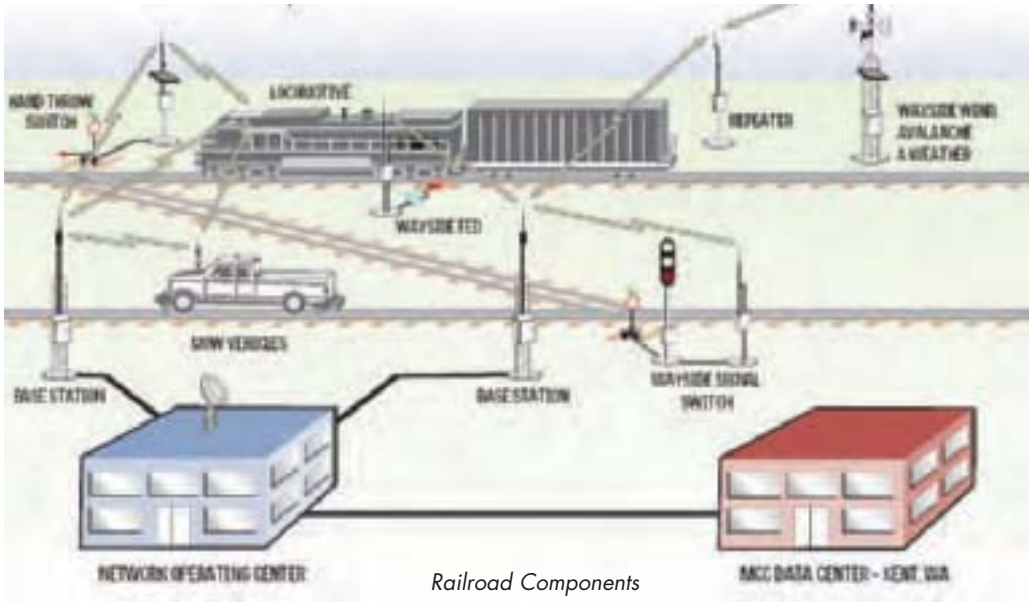
MOW Vehicles
MOW vehicles are equipped with a Vehicle Display Unit (VDU), a MeteorComm radio, and an embedded DGPS for automatically reporting position and speed to Dispatch every 15 seconds. The VDU provides the operator with visual displays and audible alarms regarding limits compliance and network integrity. Programmable proximity warnings alert the operator of nearby on-rail mobiles.

On-Board Monitoring
MeteorComm radios have three RS-232 ports and a built-in data acquisition module for interfacing directly to on-board sensors, such as fuel levels, which is then automatically reported to the NOC at pre-programmed intervals.

Wayside Devices
Signals, switches, FEDs, hotboxes and weather stations are among the many wayside devices that are monitored and controlled with MeteorComm radios. Peer-to-peer communications allow locomotives to communicate directly with wayside devices. This provides local control for immediate decision making increasing safety and reducing network loading.

Software Modules
MeteorComm's server software will manage and route all the data among all network nodes, base stations, Network Operations Centers and client facilities. GIS mapping software is available for the NOC, as well as the field, to provide a moving map display of all assets.

Railroad Components that can be part of the Wireless Network include:
LOCOMOTIVES, MOW VEHICLES, WAYSIDE SIGNALS, WAYSIDE SWITCHES, WAYSIDE FEDS OR HOTBOXES, HAND THROW SWITCHES
WAYSIDE WIND, AVALANCHE, AND WEATHER STATIONS
NETWORK OPERATING CENTER
BASE STATIONS
REPEATER STATIONS



Railroad Components

T.O.C.

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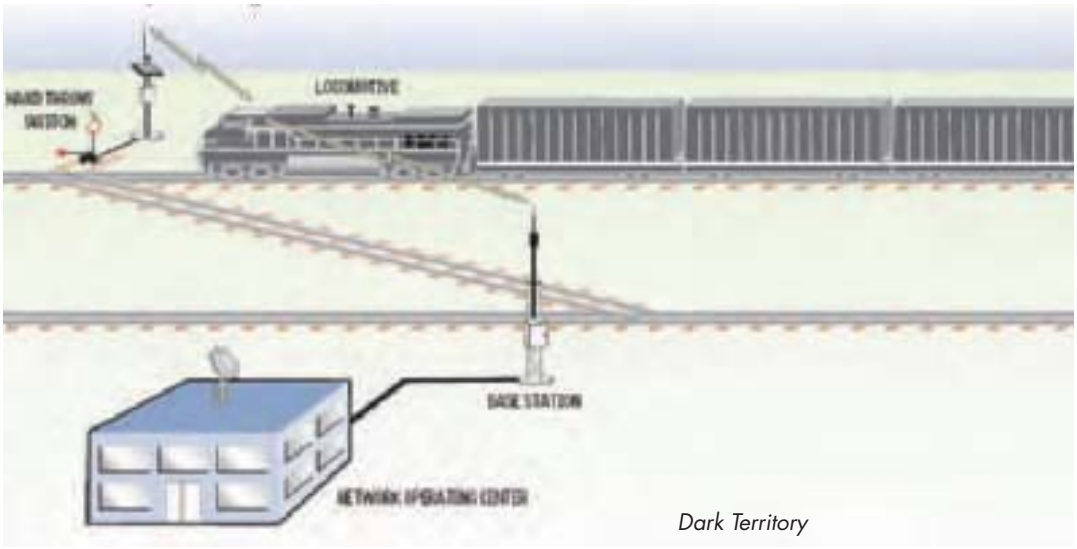
Wireless Communication Solutions

NEW

Features

- **Reliable, cost effective data communications solutions and services around the world through robust packet-switched data networks**
- **Make timely, informed decisions to enhance productivity, safety awareness and profitability**
- **Wireless radios are used to equip locomotives, MOW vehicles, signals, switches and other wayside devices allowing seamless connectivity to Dispatch, as well as peer-to-peer communication between assets**
- **Used for Hy-Rail Limits Compliance System (HLCS) and Electronic Train Management System (ETMS)**
- **The unique advantage is the robust and highly efficient MBNet-200 network protocol that has been engineered and perfected over the last 30 years**
- **Some of the major features:**
  Peer-to-peer communication
  90% utilization of a single channel
  Single software programmable radio
  Open architecture for hosting client applications
- **Base stations are being built across the United States to provide real-time communications along railroad tracks and major highways**
- **Customer's data can be routed to client NOCs or the MeteorComm™ Data Center**
- **The network has very competitive monthly service plans when compared to other types of wireless communication**
- **Track, monitor and control mobile and fixed assets including vehicles, locomotives, vessels, aircraft and remote hydro-meteorological stations**



Dark Territory

T.O.C.

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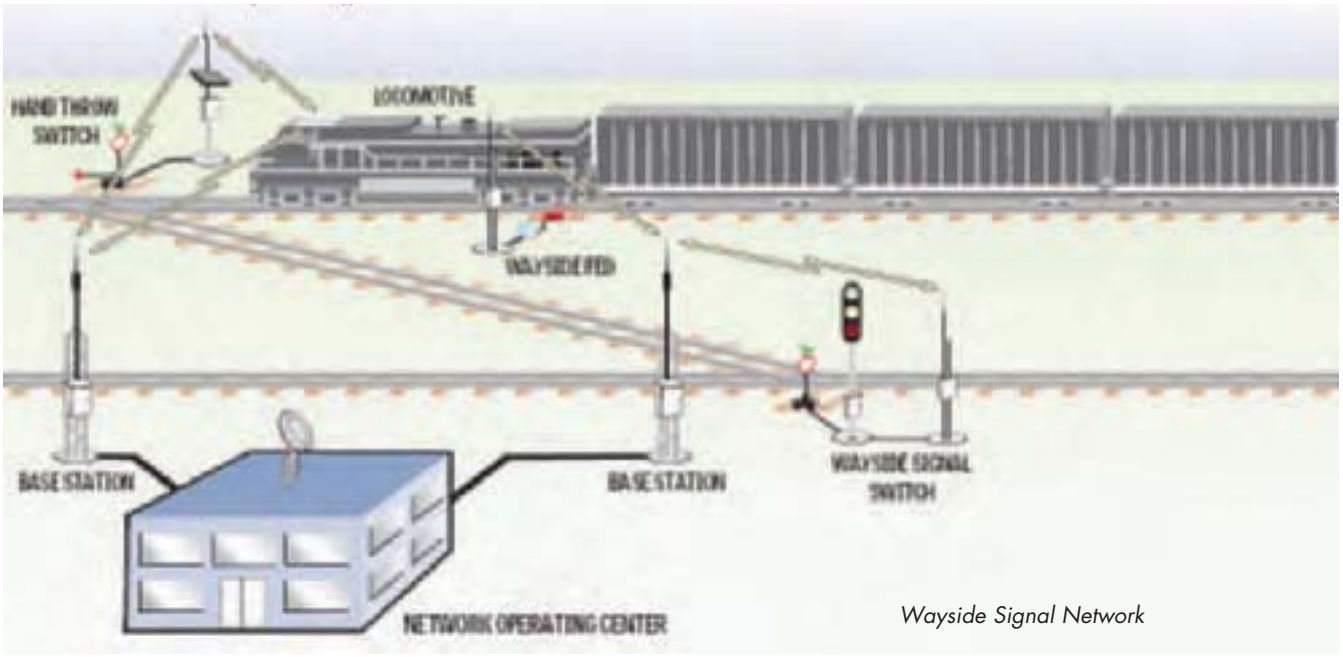
Wireless Communication Solutions



Wayside Signal Network

Ordering Information - Typical Stations

Remote Station and Customer Data Center	Price
MCC545B Packet Data Radio, including MBNet200 Software package	$2,225.00
Power Cable & Comport I/O	$36.00
Enclosure and Solar Power Package Including 20x16x10 Enclosure with pre-drilled panel for radio installation; CR10X &SS; 40W Solar Panel; Solar Regulator: 100 AH Battery	$1584.00
3-Element Yagi Antenna	$915.00
Lightning Protection	$73.00
2' RG223 Coax (lightning protector)	$27.00
25' Antenna Coax	$50.00
Total	$4,910.00

ELOS Remote Station & Customer Data Center	Price
MCC545C Packet Data Radio, including MBNet200 Software package	$2,115.00
Power Cable & Comport I/O	$36.00
Enclosure and Solar Power Package Including 20x16x10 Enclosure with pre-drilled panel for radio installation; CR10X &SS; 40W Solar Panel; Solar Regulator: 100 AH Battery	$1584.00
16' Fiberglass Whip Antenna	$268.00
Lightning Protection	$73.00
2' RG223 Coax (lightning protector)	$27.00
25' Antenna Coax	$50.00
Total	$4,153.00

For assistance in ordering and specifications on Complete Systems, please contact the ALSTOM Customer Service Center at 1-800-717-4477

T.O.C.

Wireless Communication Solutions

NEW

Features

- **Longest range industrial product in its class, providing lowest cost of ownership**
- **Secure wireless operation with multiple layers of Reliable - Designed and built for low failure rates and reduced maintenance costs.**
- **License free - Deploy immediately**
- **Flexible - The MDS iNET supports multiple users connecting to multiple applications**
- **Future proof - The MDS iNET adheres to open standards, enabling both new and old technologies to communicate.**
- **Comprehensive Network Management - Compatible with any standard off-the-shelf SNMP management system.**

Some of the largest railroads in North America, Class I Railroads, are rapidly deploying wireless technology, making communications along the railways safer and more efficient. Whether it is enabling wireless code line replacement for such functions as clearing signals and moving switch points, or remote control locomotive (RCL) technology, ALSTOM, through Microwave Data Systems (MDS) now provides railroads nationwide with wireless solutions for monitoring, security and control, as well as wireless linking between various segments of their infrastructure. For nearly two decades, Microwave Data Systems (MDS) has been providing highly secure, industrial strength mission-critical wireless communications solutions for a broad spectrum of public and private sector clients worldwide. With an installed base approaching 1,000,000 radios in 110 countries, MDS offers both licensed and license-free solutions with applications in SCADA, telemetry, public safety, telecommunications, and online transaction markets. The **MDS iNET** is a long-range, high-speed, industrial, wireless IP/Ethernet solution. This is a solid "core" to most systems. It allows customers to bring business information over Ethernet or a serial gateway and onto IP based networks. This includes mission-critical, revenue-generating data from fixed assets such as switch machines, wayside signaling controls, grade crossing controls and other train management tools. It also enables mobile network access for vehicle based operation. MDS iNET uses advanced 900 MHz FHSS technology for license-free operation in the 902-928 MHz ISM band. It is capable of up to 60-mile range and up to 512 KBPS over-the-air data rate communications. ALSTOM, through MDS, is now able to provide comprehensive, customized wireless communication solutions to our customers for many specific applications.

T.O.C.

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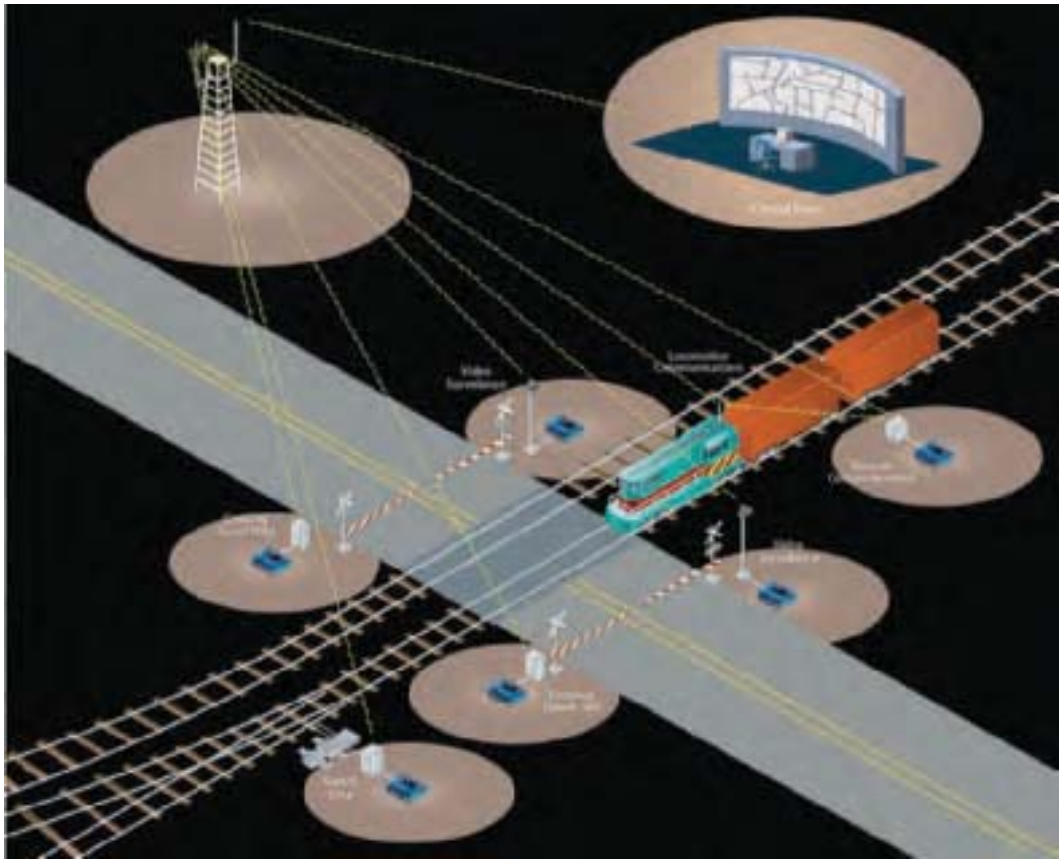

Specifications

Data	Value
Temperature	-30°C to +60°C (-22°F to +140°F)
Humidity	95% at 40°C (104°F) non-condensing
Input Power	10.5-30 Vdc
Current Consumption	Nominal
Mode Power	13.8 Vdc 24 Vdc
Transmit	7 W 510 mA 290 mA
Receive	2.8 W 200 mA 120 mA
Case	Die Cast Aluminum
Dimensions	3.15 H x 17.2 W x 11.2 D cm. (1.25 H x 6.75 W x 4.5 D in.)
Weight	908 g (2 lb.)
Mounting options	Flat surface mount brackets, DIN rail, 19" rack tray
P21 Option	
Case	Steel (rack mountable 2U)
Dimensions	8.9 H x 48.3 W x 35.6 D cm. (3.5 H x 19 W x 14 D in.)
Weight	7.6 kg, (14.7 lbs) with transceivers

Ordering Information

For more information, specifications, ordering information or to discuss a customized application package, please contact our customer service department, toll free at 1-800-717-4477 or online at info@alstomsignalingsolutions.com

T.O.C.

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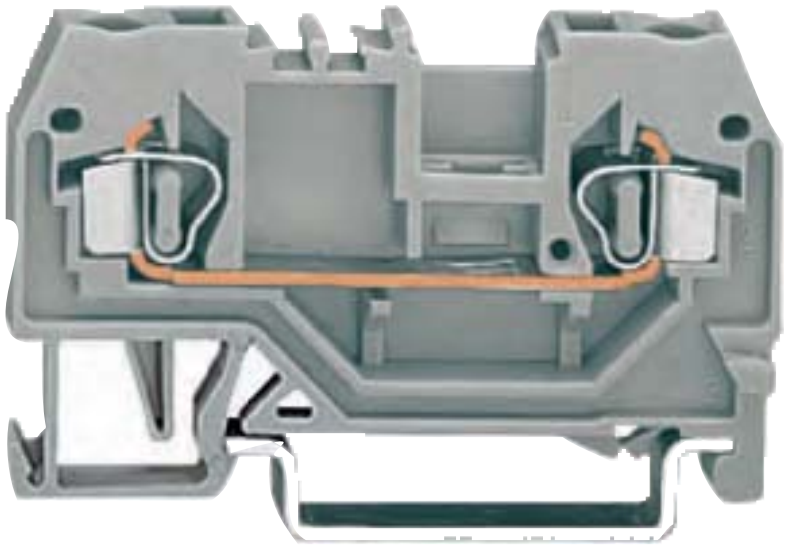
Rail Mount Terminal Blocks

NEW



Features

- **Mounts on standard 35mm DIN rail**
- **Accepts broad wire range of 28AWG –4/0 – for both solid and stranded conductors**
- **For applications up to 1000V and 200A**
- **Easy and proven Cage Clamp® connectors**

ALSTOM, through WAGO, global leader in spring pressure termination technology, now offers an unrivalled range of advanced products including DIN Rail Mounted Terminals Blocks, Connectors, Power Supplies, Outlet Boxes, Relays and Signal Conditioners. Couple an extensive installed base with a commitment to quality, safety and innovation, ALSTOM is pleased to provide this product offering. This series of DIN rail mounted terminal blocks features spring pressure wiring technology that allows screwdriver actuated wire insertion and removal of all conductor types. This technology is maintenance free, gas-tight, vibration proof, thermal cycling resistant, and up to 70% faster than wiring with screw type terminal blocks.

These DIN rail mount terminal blocks are available in single level 2, 3 and 4 conductor feed-through types as well as double and triple level configurations. Ground blocks are also available in these various configurations. Generally we use the term “pluggable” Application specific functions include; fuse holders, disconnects, built in diodes, surge suppression, plug-able connectors, sensor/actuator terminal blocks, and hazardous location rated terminals. A broad range of accessories is available to complete the system and includes marking systems, jumpers, shield connection, end stops, assembly covers and test plugs.

Ordering Information

For assistance in ordering and specification, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

Chassis Mount Terminal Blocks

Features

- **Accepts broad wire range of 28AWG for both solid and stranded conductors**
- **Wire range of AWG 28 -AWG12 rated at 600V-20A for the 264 Series**
- **Wire range for the 862 Series is AWG 20 - AWG 12 with a rating of 300V-20A and 600V - 5A**
- **Easy and proven Cage Clamp connectors**

NEW

This series of **chassis mounted terminal blocks** features spring pressure wiring technology that allows screwdriver actuated wire insertion and removal of all conductor types. This technology is maintenance free, gas-tight, vibration proof, thermal cycling resistant, and up to 70% faster than wiring with screw type terminal blocks. These chassis mount terminal blocks feature 2 or 4 conductors per pole, built-in test points, multiple chassis mounting options and pre-printed, write-on or label marking systems. This line of chassis mount terminal blocks accommodates wire gauges from 12 -28AWG. Terminal blocks can accommodate side or space saving top wire entry. Terminal blocks can be affixed to panels either with fixing flanges or through snap in mounting feet. Terminal blocks come in various colors including grey, blue, orange, and green/yellow. The 260 series accommodates 16-28 AWG. The product is completely modular and easy to snap together or break apart. The 264 series accommodates 12-28 AWG and can be chassis mounted or Din Rail mounted. The terminal blocks are completely modular and can snap together or break apart easily. The blocks can be mounted to a chassis via a fixing flange or via snap in mounting feet.

Ordering Information

For assistance in ordering and specification, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

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Splicing Connectors & Multi Connection Systems

Features

- **Easy and secure**
- **Speeds assembly time**
- **Easy circuit testing**
- **773 Series and 222 Series, Push In Leaf and Cage Clamp connection, respectively**

The **773 series** are a reliable and easy to wire replacement for twist type connectors. To operate, simply strip the wire, solid or stranded, and insert into the clamping unit by hand. Features of this series include clear housing for visual inspection of the connection, built-in test points, and chassis/DIN rail-mounting carrier. The 222 series wire splice connectors feature lever operated spring pressure wiring technology for solid and stranded conductors. Features of this connector system include compact size, built-in test points, as well as built-in wire strip length verification.

Ordering Information

Ordering Number	Description	AWG	Rating	Price
773-162	2-conductor, yellow	18-12 Sol; 16-12 Str	600V/20A	Call for Price
773-164	4-conductor, orange	18-12 Sol; 16-12 Str	600V/20A	Call for Price
773-166	6-conductor, purple	18-12 Sol; 16-12 Str	600V/20A	Call for Price
773-168	8-conductor, dark gray	18-12 Sol; 16-12 Str	600V/20A	Call for Price
773-173	3-conductor, Red	14-10 Sol & Str	600V/30A	Call for Price
Series 222 Connectors				
222-413-conductor, gray w/orange levers	28-12 Sol & Str	600V/20A		Call for Price
222-415-conductor, gray w/orange levers	28-12 Sol & Str	600V/20A		Call for Price

For assistance in ordering and specification of Multi-connection systems, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

Power Supplies, Outlets and Conditioning

Features

NEW

- **Switching Power Supplies**
  Meets global requirements with Universal Input
  Broad output range up to 960W (40A @24V)
  Industrial Grade housing offers ventilated compact design
  Built In protection against short circuit , thermal overload and/or surge
  Operates up to 120˚F

- **Convenient Power Outlets**
  Provides a convenient power source in the control cabinet for laptops, lighting, test equipment etc.
  No assembly required, just mount on DIN rail and connect
  Available in standard duplex, 20A duplex, GFCI, isolated ground, switch controlled duplex, switched box, international duplex and custom solutions

- **Signal Conditioning**
  0-10V, 0-20mA, and 4-20mA analog conditioning
  DC to DC, A/D, and D/A converters
  Pluggable modules for quick installation

- **Surge Protection**
  Protection against transient and over voltage conditions in both DC and AC circuits
  Surge technologies include metal oxide varistors, suppression diodes, and /or gas tube arrestors

Ordering Information

For assistance in ordering and specification, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

Primary Surge Protection Devices

NEW

Features

- **Protects all possible paths of transients**
- **Bi-directional application**
- **Environmentally safe and built to survive in hostile railway installations**
- **High energy surge suppression (206kA, 8/20_s)**

These **Primary Surge Protection Devices** have been specially designed for the rail industry to provide surge protection that exceeds AREMA requirements and industry standards. The primary surge devices utilize patented Transient Discriminating (TD) technology, thus providing proven protection from transient surges, over-voltages and electrical line noise. It is a low cost, economical way to protect sensitive electronic systems. The EPD100HZ120TDF is used on 120 VAC, 100 Hz main entrance to protect against transients and EMI/RFI noise. The unit is designed for 120 VAC, 100 Hz Single Phase 2 Wire ungrounded system. Internal fusing allows installation of unit at main entrance, unit is fused on both incoming lines. This low cost unit provides 80 kA (8/20µ) of surge current protection with 40 dB noise attenuation at 100 kHz. The EPD100HZ120TDF protects incoming AC power to the load center and AC distribution to sensitive electronic equipment The EPD120/240TDFL has been specially designed for the rail industry to provide surge protection that exceeds AREMA requirements and industry standards. It utilizes patented Transient Discriminating (TD) technology, thus providing proven protection from transient surges, over-voltages and electrical line noise. The EPD120/240TDFL is used on sub panels and small main panels to safeguard against transients and EMI/RFI noise. The unit is designed for 120/240 VAC WYE systems. This low cost unit provides 206kA (8/20µ) of surge current protection with 40 dB noise attenuation at 100 kHz.

Ordering Information

Ordering Number	Description	Price
EPD100HZ120TDF	Surge Protector	Call for Price
EPD120/240TDFL	Surge Protector	Call for Price

For assistance in ordering and specification, please contact the ALSTOM Customer Service Center at 800-717-4477

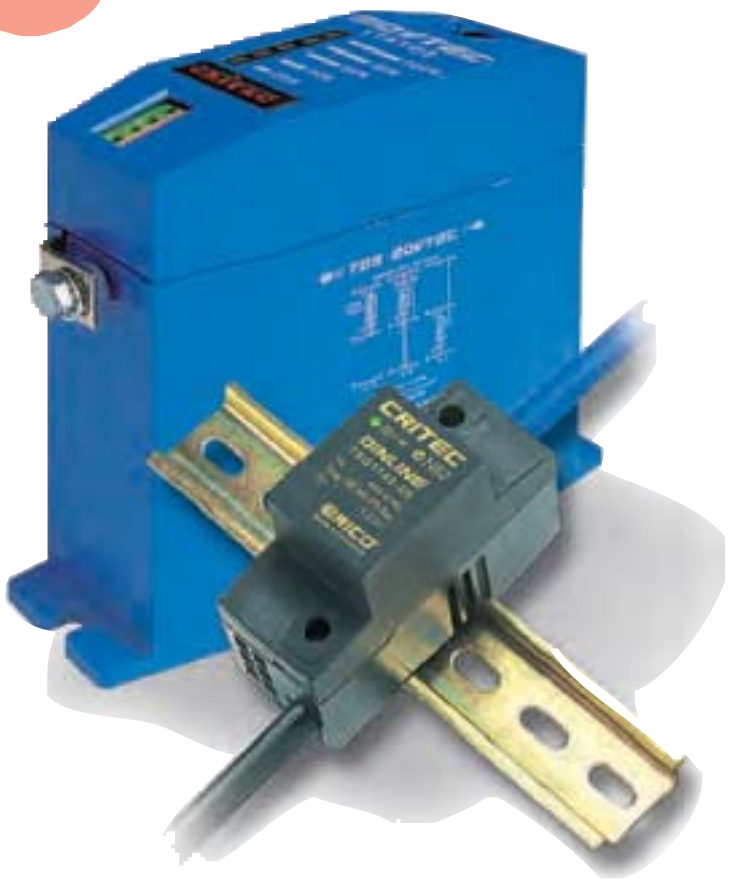
T.O.C.

DINLINE Surge Filter
DSF Series

Features

- **Easy installation on 35mm DIN Rail Mountings**
- **Compact design fits into most switch & distribution boards**
- **Electronic power indicator ideal for poorly illuminated locations**
- **EMI/FRI noise filtering**
- **Three Mode protection L-N, L-G, N-G**
- **C-Tick and CE Approved. DSF6A30V is also NOM Approved**

NEW



The **DINLINE surge filter** is designed for the protection of strategic equipment or those supplying critical applications. As well as providing shunt protection, it filters the clamped waveform to reduce the rate of voltage rise providing superior protection for sensitive electronic equipment.

Ordering Information

Ordering Number	Description	Price
DSF 6A 30V	DINLINE Surge Filter - 1 Phase 2W+G, 6A Series Filter, 30V	Call for Price
DSF 6A 150V	DINLINE Surge Filter - 1 Phase 2W+G, 6A Series Filter, 150V	Call for Price
DSF 6A 275V	DINLINE Surge Filter - 1 Phase 2W+G, 6A Series Filter, 275V	Call for Price
DSF 20A 275V	DINLINE Surge Filter - 1 Phase 2W+G, 20A Series Filter, 275V	Call for Price

For assistance in ordering and specification, please contact the ALSTOM Customer Service Center at 800-717-4477

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TDF Surge Protection

NEW

Features

- **Compact design fits into most distribution panels and motor control centers**
- **High efficiency sine wave filtering - ideal for the protection of switched mode power supplies**
- **35mm DIN rail mount**
- **Fail-safe LED indication and opto-isolated output for remote status monitoring**
- **High surge rating 50kA ensures long service life**
- **Transient Discriminating technology ensures safe operation during abnormal over-voltage events**

Designed to protect the switched mode power supply units on devices. Units are available for 3A, 10A and 20A loads and in a range of clamping voltages including 30V, 150V and 275V. The space efficient low pass filter, provides up to 62dB of attenuation to voltage transients to further reduce the steep rates of rise of voltage and current providing superior protection for sensitive electronic equipment.

Applications

- Power surge and transient protection for sensitive electrical and electronic loads: PLCs, SCADA, Motor Controllers, and RTUs.
- Protection of subcircuits or specific equipment which may be remote from point-of-entry protection
- Protection for rail and transit signal and communication systems

Ordering Information

Ordering Number	Description	Price
TDF3A 120V	120V 1 phase 2W+G, 50kA 8/20µs, 3A series protector	Call for Price
TDF3A 240V	240V 1 phase 2W+G, 50kA 8/20µs, 3A series protector	Call for Price
TDF10A 120V	120V 1 phase 2W+G, 50kA 8/20µs, 10A series protector	Call for Price
TDF10A 240V	240V 1 phase 2W+G, 50kA 8/20µs, 10A series protector	Call for Price
TDF20A 120V	120V 1 phase 2W+G, 50kA 8/20µs, 20A series protector	Call for Price
TDF20A 240V	240V 1 phase 2W+G, 50kA 8/20µs, 20A series protector	Call for Price

For assistance in ordering and specification, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

Universal Transient Barrier
UTB Series

Features

- **Separate plug and base design – facilitates ease of module replacement**
- **Ease of grounding - through DIN rail or via terminal**
- **Efficient, three stage clamping circuit technology ensures low let-through voltage**
- **Over-voltage and self-resetting over-current protection**
- **Models to suit line currents up to 1.5A**
- **Models to suit frequencies up to 3MHz**
- **High surge rating ensures adequate protection with long service life**

Rail environments are prone to dangerous and damaging transients and surges that can be induced onto signal lines as a result of lightning and power switching. Uncontrolled surges and transients create danger in terms of occupational health and safety and can lead to expensive equipment repairs, considerable production downtime, loss of revenue and loss of profits. The UTB uses a hybrid, three stage clamping circuit, to ensure the best possible protection to sensitive electronic equipment while maintaining a minimum of line interference and insertion losses.

Applications

- Balanced pair signal lines and low voltage secondary power supply systems including such systems as: Programmable logic controllers (PLC's), Rail and transit signals, and Supervisory and control and data acquisition (SCADA) equipment.

Ordering Information

Ordering Number	Description	Price
UTB 5	UTB 0-7Vpk, DIN profile, Modular, 20kA, 1.5A Load Current	Call for Price
UTB 15	UTB 5-18Vpk, DIN profile, Modular, 20kA, 1.5A Load Current	Call for Price
UTB 30	UTB 15-33Vpk, DIN profile, Modular, 20kA, 1.5A Load Current	Call for Price
UTB 60	UTB 30-64Vpk, DIN profile, Modular, 20kA, 1.5A Load Current	Call for Price
UTB 110	UTB 120Vac, DIN profile, Modular, 20kA, 1.5A Load Current	Call for Price
UTB SA	UTB DIN profile, Modular, 20kA for telephone/modem protection	Call for Price
UTB TA	UTB DIN profile, Modular, Secondary Telephone Protector for USA	Call for Price

For assistance in ordering and specification, please contact the ALSTOM Customer Service Center at 800-717-4477

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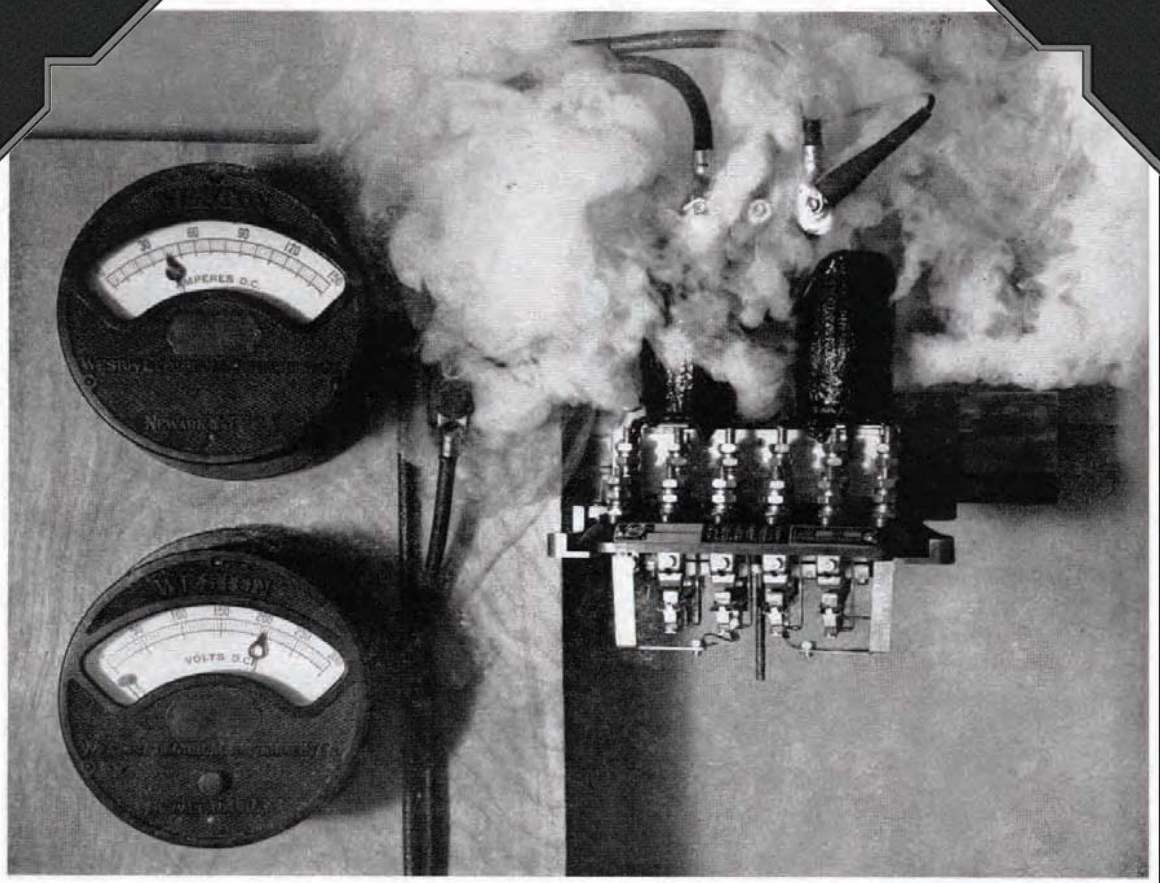
Looking Back



8,000 WATTS IN THE COILS and the armature doesn't pick up!

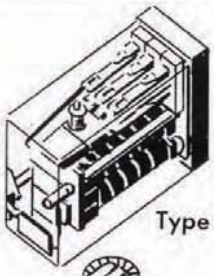
We don't suggest that you treat your relays like this. We *do* suggest that this picture illustrates the reliability and ruggedness of GRS relays.

The biased-neutral relay shown here picked up when a current of 75 milliamperes flowed through the coils in the proper direction. But when the current was reversed, the armature dropped and stayed down, even with 205 volts driving 42 *amperes* through the coils.

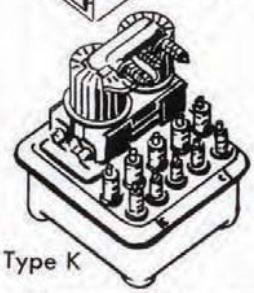
You can see the clouds of smoke that result from dissipating 8000 watts in the coils instead of the milliwatts of normal service. What you can't see is that after the switch was pulled and the smoke had cleared away the operating values of this relay had changed less than ¼ percent. This kind of performance typifies the dependability built into every GRS relay—track, line, or special purpose.

GENERAL RAILWAY SIGNAL COMPANY

ROCHESTER 2, N. Y. NEW YORK 17 • CHICAGO 1 • ST. LOUIS 1



Type B



Type K

GRS offers you two complete lines of relays for vital circuits: Type B, a modern plug-in relay; a Type K, with A.A.R. t minals or plug cou

May 1957 Advertisement

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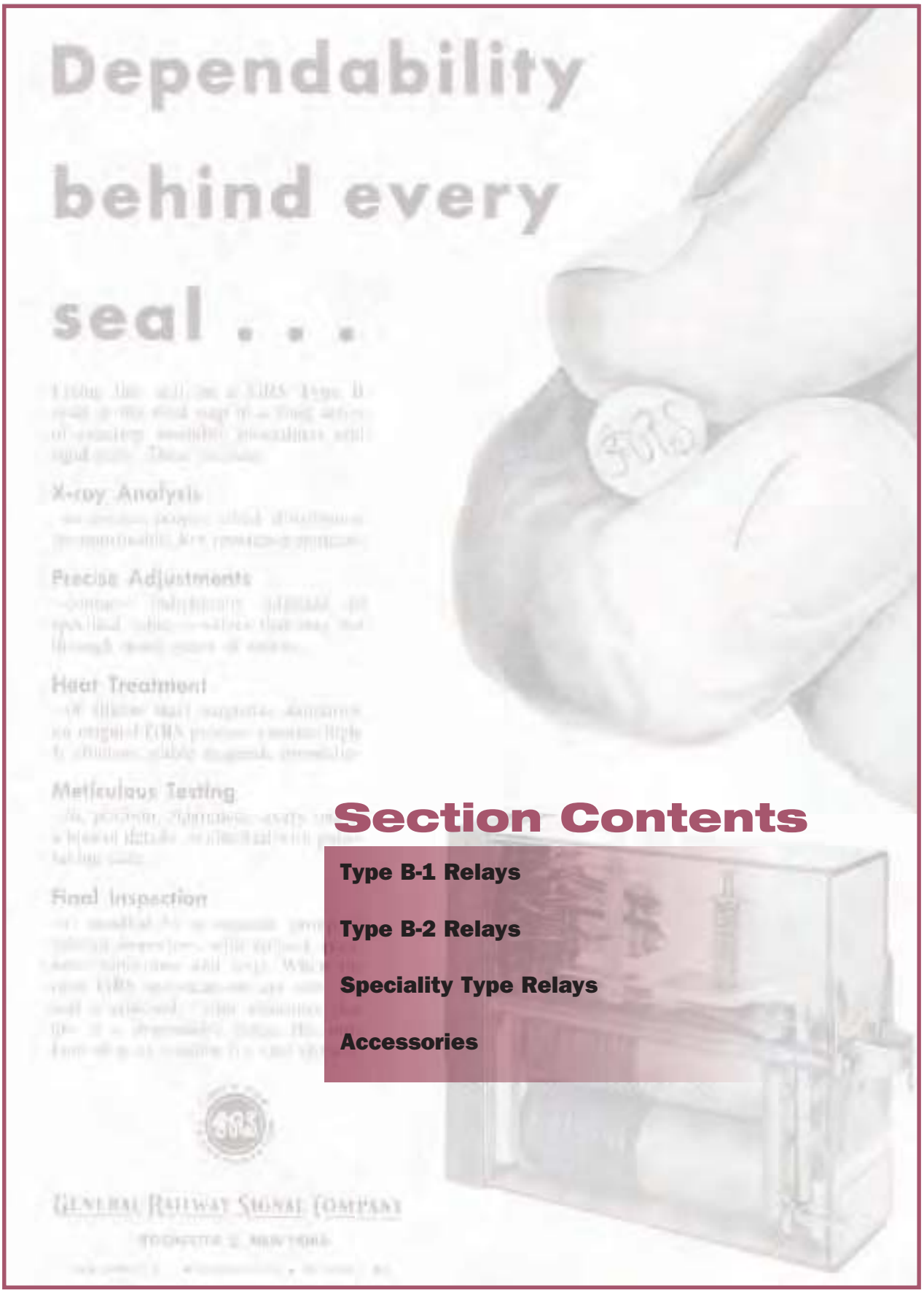

Section Contents

Type B-1 Relays

Type B-2 Relays

Speciality Type Relays

Accessories

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Type B Series
Vital Relays Introduction

Past Experience Applied for Future Perfection

ALSTOM **Plug-in Relays** combine the tradition of excellence established by GRS with the innovation and resources of ALSTOM to perfect the technology, first introduced by GRS nearly 70 years ago. Today, ALSTOM relays are considered to be the standard in the industry. Available in a wide range of types and configurations, ALSTOM relays improve reliability, reduce maintenance and maximize operating life. They may be rack-installed in equipment rooms, wayside cases or housings. ALSTOM Type B Vital Circuit Relays are available in two sizes – B1 and B2. Two B1 relays occupy the same space as a single B2 relay. Type B Relays install quickly and easily, making positive mechanical and electrical connections to their plugboard terminals. The contact and coil structures terminate at the base of the relay as prongs. The plugboard has wedge-shaped plug insulators. Guide rods ensure that the prongs and plug insulators make proper contact. Registration plates prevent improper installation of non-compatible relays to a plugboard. Some Type B relays are energized by DC voltage, others by AC voltage. They are designed to meet the important requirements of safety, reliability, low maintenance and long operating life. A vital Type B relay is designed so that the probability of its failing to return to a prescribed state when it is de-energized is so low that for all practical purposes it is considered to be nonexistent.

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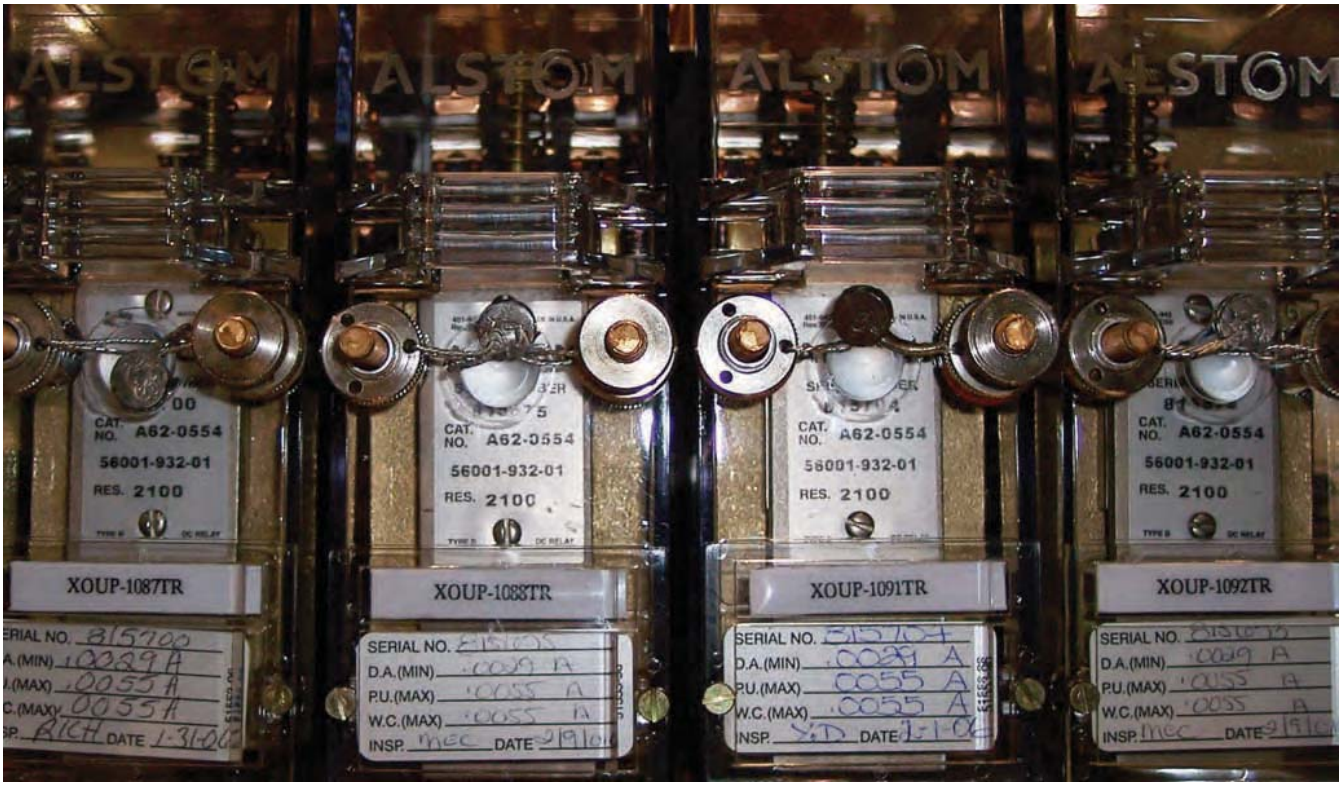
Type B Series
Vital Relays Introduction



In Stock for Immediate Delivery

Specifications

Type B1

- Height of relay - 6.3125” (16.034 cm)
- Width of relay - 2.4375” (6.191 cm)
- Depth without plugboard - 8.5625” (21.749 cm)
- Depth including plugboard - 15.5” (39.370 cm)fully wired (approx.)
- Weight of relay with plugboard - 7-10 lbs. (3.18-4.54 kg) (weight of wiring not included)
- Weight of plugboard alone without wiring - 1 lb. (0.454 kg)

Type B2

- Height of relay - 6.3125” (16.034 cm)
- Width of relay - 4.9375” (12.541 cm)
- Depth without plugboard - 8.5625” (21.749 cm)
- Depth including plugboard - 15.5” (39.370 cm) fully wired (approx.)
- Weight of relay with plugboard - 10-15 lbs. (3.18-6.80 kg) (weight of wiring not included)
- Weight of plugboard alone without wiring - 2 lbs. (0.907 kg)

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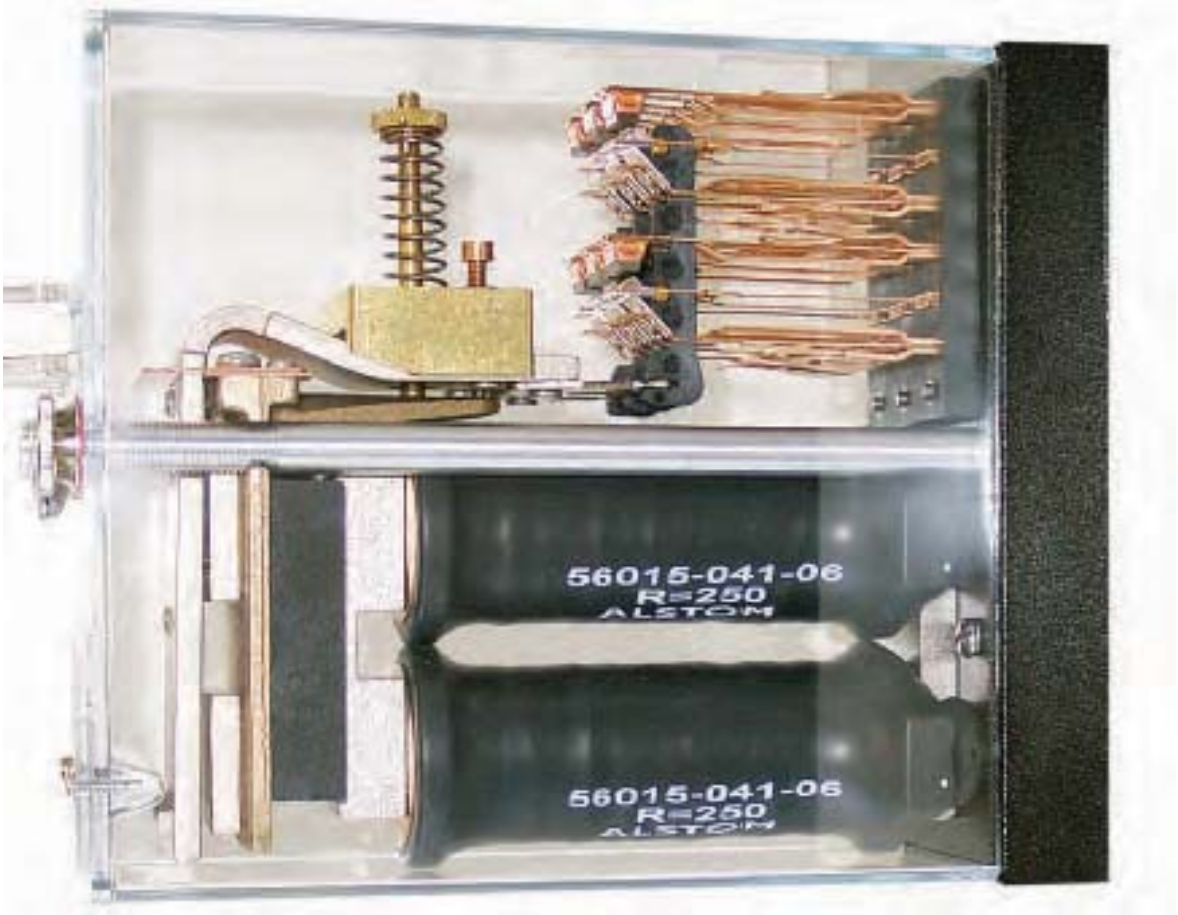
Type B Series
Vital Relays Contacts



Contact Combinations

Type B1 Relays have space for three contact groups while Type B2 Relays feature six contact group spaces:

Type B1	
Neutral	2FB, 4FB, 4F-2B, 4FB-2F-1B, 6FB
Biased-Neutral	4FB-2F-1B, 6FB
Power Transfer	2FB, 6FB
Light-Out	4FB, 4F-2B, 6FB

Type B2	
Neutral	12FB, 8FB-2F, 8FB-4F-2B
Biased-Neutral	8FB-4F-2B, 12FB
Polarized	4FB-4NR, 6NR, 4NR-2FB-2F

Note: F represents Front independent contacts, B represents Back dependent contacts, FB represents Front-Back dependent contacts,and NR represents Normal-Reverse dependent contacts

Contact Types

Type B Relays may have regular, heavy-duty or heavy-duty with magnetic blowout contacts.

Contact Type	Load	Material
Regular	4 Amp continuous (resistive)	Front: Silver-impregnated carbon to Silver Back: Silver-to-Silver
Heavy Duty	>4 Amps continuous (resistive) Range 1: < 30V Range 2: 30V – 175V	Front: Silver-impregnated carbon to Silver Back: Silver-impregnated carbon to Silver
Heavy Duty with Magnetic Blowout	>4 Amps continuous (resistive) Range 2: 30V – 175V Range 3: 175V – 250V	Front and back contacts include magnets to facilitate "blow-out" function when electric arc is present.

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Type B Series
Vital Relays Coils and Name Plates

Type B Relays may have one or two coils. A typical coil is wound on a phenolic spool which slips over the core of the relay. Relays with one coil may have one or two windings while relays with two coils may have up to three windings. Leads from the windings fasten to prongs which engage the plugboard. Slow-acting relays are made by placing copper washers or copper/aluminum slugs on the cores. The more washers, or the longer the slug, the slower acting the relay.

All Type B Relays have a name plate displaying the catalog number, drawing number, serial number and nominal coil resistance. The relay cover contains the tag holder for up to two separate tags: a tag for relay operating and testing data and a tag for circuit designation.

Ordering Information

For assistance in ordering or requesting further information on Type B Series Vital Relays, coils, contacts, name plates and other parts please contact the ALSTOM Customer Service Center 1-800-717-4477. Also, ED sheets are not available for ALL relays and are available online at www.alstomsignalingsolutions.com.

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Type B1 and B2
Biased-Neutral Relays

Features

- **Picks up only with proper polarity voltage**
- **Fifty times normal voltage for 2 seconds will not affect relay operation**
- **Will not pick up on reverse polarity**

Call on ALSTOM's Service and Repair to rebuild your Relay

Introduced in 1935, the **type B1 and B2** relays are still the industry standard. To date, over 2 million have been sold. Biased-Neutral Relays pick up only if a voltage of the proper polarity is applied to the coils - a characteristic provided by a permanent magnet and a leakage strip bridging the cores and placed between the coils and armature. Fifty times normal relay working voltage applied for 2-seconds at both normal and reverse polarity will not affect relay operating characteristics more than 2%, and will not pick up the armature on reverse polarity.

Ordering Information

For assistance in ordering or requesting further information on Type B1 and B2 Biased-Neutral Relays, please contact the ALSTOM Customer Service Center 800-717-4477

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Ordering Information

Relay Size	Contacts	Nominal Resistance Ω	Max Pickup and Working Amperes	Notations	Ordering Number	Price
B1	2F-2B	2100	0.0093	EHD Contacts	56001-942-01	$ 695.00
B1	4FB-2F-1B	2	0.158		56001-921-09	$ 740.00
B1	4FB-2F-1B	500	0.0121		56001-921-07	$ 720.00
B1	6FB	500	0.0121		56001-922-07 (†)	$ 740.00
B1	4FB-2F-1B	100	0.026		56001-921-02	$ 740.00
B1	4FB-2F-1B	63	0.0305		56001-921-05	$ 642.00
B1	4FB-2F-1B	375	0.0126		56001-921-14	$ 675.00
B1	4FB-2F-1B	750	0.0084		56001-921-10	$ 599.00
B1	6FB	63	0.0305		56001-922-05	$ 740.00
B1	6FB	250	0.0168		56001-922-01	$ 595.00
B1	6FB	100	0.026		56001-922-02	$ 596.00
B1	6FB	1	0.236		56001-922-10 (†)	$ 599.00
B1	2FB-4F-2B	1000	0.0088		56001-927-01 (†)	$ 695.00
B1	2FB-3F-3B	1000	0.0088		56001-928-01 (†)	$ 800.00
B1	4FB-2F-1B	2100	0.0058		56001-932-01	$ 639.00
B1	2FB-4F-2B	2100	0.0058		56001-933-01	$ 659.00
B1	4FB-2F-1B	500	0.0121	HD Contacts(*)	56001-956-01	$ 619.00
B1	4FB-2F-1B	2	0.158	HD Contacts(*)	56001-956-02	$ 679.00
B1	4FB-2F-1B	1000	0.009		56001-921-04	$ 754.00
B1	5F-4B	0.5(**)	0.32	High % Release	56001-961-01	$ 720.00
B1	5F-4B	0.5(**)	0.374	High % Release	56001-965-01	$ 749.00
B1	6FB	2	0.13		56001-968-01	$ 750.00
B1	5F-4B	4	0.126		56001-963-01	$ 765.00
B1	2FB-4F-2B	2100	0.0058	Special Single Coil DA	56001-970-01	$ 695.00
B1	2FB-4F-2B	2100	0.0058	HD Contacts(1)	56001-945-01	$ 629.00
B1	8F-1B (1)	2100	0.0058	Tightly Controlled DA	56001-971-01	$ 795.00
B1	5F-1B-2FB	100	0.026	1B is AgC	56001-972-01	$ 695.00
B1	5F-1B-2FB	2100	0.0058	1B is AgC	56001-973-01	$ 959.00
B1	6FB	4	0.109		56001-979-01	$ 695.00
B1	4FB-1F-2B	750	0.0084		56001-925-10	$ 689.00
B1	2F-2B	500	0.019	EHD Contacts	56001-926-01	$ 732.00
B1	4FB-2F-1B	2100	0.0099		56001-980-01	$ 675.00
B1	8F-1B	2100	0.0058	(2F-1B) HD, 1B is AgC	56001-969-01	$ 750.00
B1	4FB	0.072(**)	0.91	AC Immune, High % Release	56001-976-01	$ 930.00
B2	8FB-4F-2B	350	0.0189		56002-719-01	$2,200.00
B2	12FB	350	0.0189		56002-720-01	$1,950.00
B1	4FB-2F-1B	.5(2)	.393		56001-987-01(†)	Call
B1	4FB-2F-1B	2100	.0058		56001-986-01(†)	Call
B1	2FB-4F-2B	2100	.0099	HD Contacts	56001-984-01(†)	Call

Note (*): Silver-Impregnated Carbon fronts and backs.
Note (**): Resistance with coils in parallel.
Note (†) : Available with a shock indicator.

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Type B1 Flasher Relay
(Direct Current)

Features

- **Maintains constant flashing rate**
- **48 to 54 flashes per minute for highway crossing**
- **56 to 64 flashes per minute for wayside signals**
- **Equipped with heavy-duty contacts**

This electronically-driven highway-crossing flasher consists of a **Type B1 Neutral** Relay and a solid state flasher module. The flasher module is designed for use with either AC or DC power. If using AC, the current must be rectified and filtered. DC current can come from a battery or from a line outside the case with an arrester with a 1000V breakdown rating or less for surge protection. The flasher operates at a constant rate through an 8-16 Volt input range, and it maintains a constant ratio of "on-off" time throughout a temperature range of -40°F to 160°F (-40°C to 70°C). The flasher module establishes and maintains a flashing rate of 48 to 54 flashes per minute for highway-crossing signals, and 56 to 64 flashes per minute for flashing wayside aspects. The flasher module drives the Type B1 Neutral Relay which is equipped with four dependent front-back, heavy duty, lamp-control contacts (silver-cadmium-oxide). Full back contact pressure is maintained when the relay is not operating. The flasher module is mounted on the back of the relay plugboard. Each flasher module can drive up to three 60 ohm flasher relays in parallel.

Ordering Information

Component	Ordering Number	Price
Flasher Relay (60 Ω)	56001-985-01	$ 616.00
Flasher Module, includes mounting kit, 48-54 flashes per minute	30733-001-04	$ 201.00
Flasher, includes mounting kit, 56-64 flashes per minute	30733-001-05	$ 228.00
Mounting Kit	17550-071-01	$ 99.00
Flasher Module 48-54 Flashes per minute Drives 1,2,or 3 60 Ω flasher relays in parallel	30733-003-01	
Flasher Module Rate 56-64 flashes per minute Drives 1,2,or 3 60 Ω flasher relays in parallel	30733-001-02	
Flasher Module Rate 48-54 flashes per minute Drives 1 18 Ω flasher relay	30733-003-03	
Flasher Module Rate 56-64 flashes per minute Drives 1 18 Ω flasher relay	30733-003-04	

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Type B1 Light-Out
Neutral Relay (AC or DC)

Features

- **Detects signal lamp failures**
- **Operates on either AC or DC current**
- **Can be used with double filament lamps**

Light-Out Neutral Relays are used to detect signal lamp failures. They operate on either AC or DC current. Relays with low-resistance windings are used for hot-filament checks; relays with both low- and high-resistance windings are used for hot and cold filament checks. Where double filament lamps are used, the relays may be furnished to either hold up or drop out when the main filament opens. Front contacts are silver-impregnated carbon to silver. Back contacts are metal to metal.

Ordering Information

Contacts	Nominal Resistance Ω	Use with lamp Volts @ 60Hz	Watts	Max.Working Amps AC/DC For low resistance winding	Ordering Number	Price
4FB	0.24	10	5+3.5	0.68	56001-785-35	$695.00
4FB	450-0.45	10	5	0.388	56001-785-59	$795.00
4FB	450-0.069	10	18+3.5	1.52	56001-785-61	$700.00
4FB	450-0.12	12.0-16.0	21(CP)	0.883	56001-873-01	$580.00
6FB	450-0.2	10	10	0.84	56001-785-10	$745.00
4FB	0.4	10	13+3.5	0.294	56001-785-55	$749.00
An external rectifier is required for operation and must be ordered separately.						
Rectifier					54728-062-01	$395.00

For assistance in ordering or requesting further information on Type B1 Flasher Relay and B1 Light-Out Neutral Relays, please contact the ALSTOM Customer Service Center 800-717-4477

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Type B1
Lamp-Control Relay (Direct Current)

Features

- **Controls highway crossing flashing light lamp circuits**
- **Able to handle heavy surge current of lamps**
- **Used in 2 million installs world wide. or the standard in signal relays**
- **Two no bounce back contacts**

The **Lamp-Control Relay** is used primarily for controlling lamp circuits at highway grade crossings equipped with flashing lights. It has two regular front-back contacts and two back contacts for handling the heavy surge current characteristic of highway crossing lamps. The back contacts are rated at 15 Amperes at 12 Volts AC or DC. The front contacts are silver-impregnated carbon to silver, and the back contacts are silver to

Ordering Information

Contacts	Nominal Resistance Ω	System Voltage	Ordering Number	Price
2FB-2B	210	10	56001-880-01	$ 995.00

For assistance in ordering or requesting further information on Type B1 Lamp-Control Relays, please contact the ALSTOM Customer Service Center 800-717-4477

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Type B1 Power Transfer
Neutral Relay (Rectified AC)

Features

- **A DC line relay which operates on rectified AC**
- **Automatically switches to battery if AC fails**
- **Contacts able to carry 15 Amps at 15 Volts**

The **Power-Transfer Neutral** Relay is essentially a DC line relay operating on rectified AC. If AC energy fails, the relay armature drops, automatically transferring the circuits to local battery. The ratio of release voltage to pickup voltage is about 75 percent, to provide transfer before signal aspects are impaired. Contacts are silver to silver, or silver-impregnated carbon to silver, with a capacity of 15 Amperes at 15 Volts. An external rectifier is required for operation and must be ordered separately.

Ordering Information

Contacts Heavy-Duty 15 Amps, 15 Volts	Rated Volts AC	Nominal Resistance Ω	Ordering Number	Price
6FB(*)	10	100-100	56001-745-01	$ 610.00
6FB(**)	10	100-100	56001-947-01	$ 612.00
6FB(*)	12	100-100	56001-745-02 (†)	$ 614.00
An external rectifier is required for operation and must be ordered separately.				
AC Rectifier			59899-005-03	$ 149.00

Note (*): Silver-to-Silver contacts
Note (**): Silver-Impregnated Carbon to Silver Fronts, Silver to Silver backs
Note (†): Available with a shock indicator

For assistance in ordering or requesting further information on Type B1 Power Transfer Neutral Relays, please contact the ALSTOM Customer Service Center 800-717-4477

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Type B1
Code Responsive Relay (Direct Current)

Features

- **Responds quickly to pulses of coded energy**
- **Contacts close only with proper polarity voltage**
- **Operates in response to changes in direction of current**

Code-Responsive Relays are made with an armature and contact structure that responds quickly to pulses of coded energy as high as four pulses per second. The B1 Code Responsive Relay has three basic internal structures. The first has two dependent front-back contacts. The second has four dependent front-back contacts and is usually supplied for heavy service since the contact design provides more effective non-bounce characteristics.

The third structure is a Polar-Stick (or Magnetic-Stick) Code-Responsive Relay, that is similar to the first structure without a bias spring assembly.

In the first two types, the armatures are polarized by two permanent magnets, which allow the front contacts to close only if voltage of the proper polarity is applied (polar-biased). When the relay is de-energized, the bias spring together with magnetic bias, returns the armature to the de-energized position closing the back contacts.

The Polar-Stick Relay operates in response to a change in the direction of the current flow in its coils. The armature stays in its last-operating position when the energy is cut off, held in place by the two permanent magnets.

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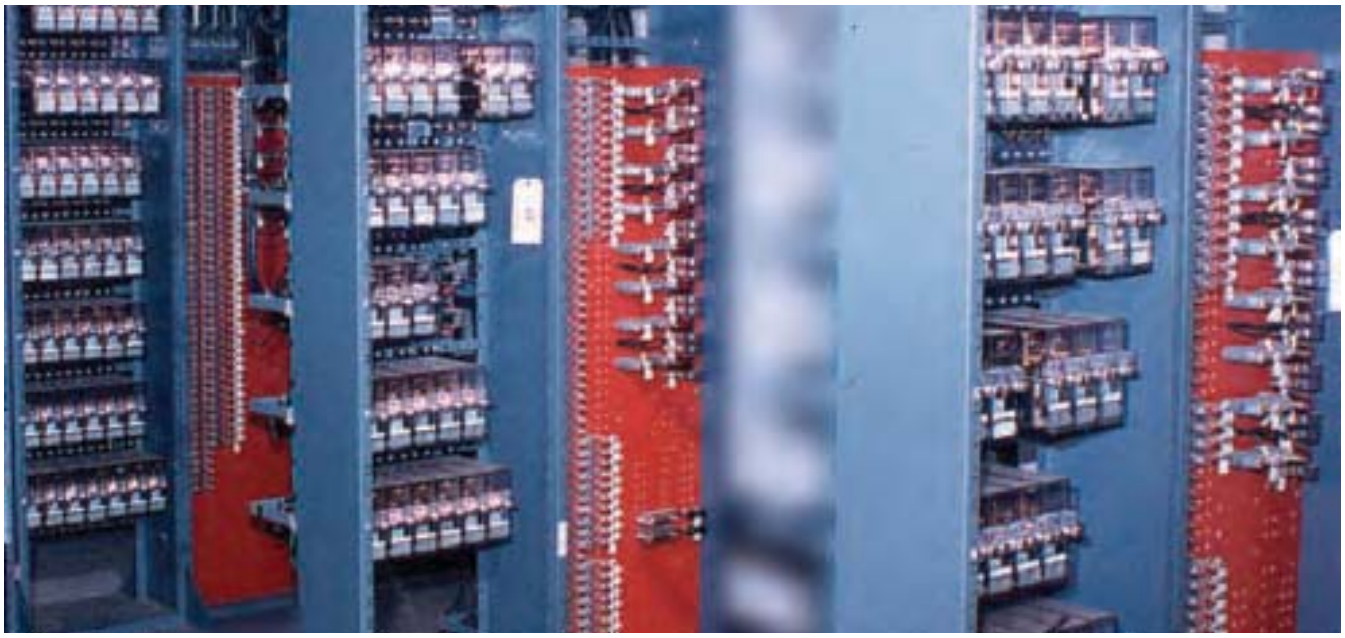
Type B1
Code Responsive Relay (Direct Current)

Ordering Information

Contacts	Nominal System Voltage	Nominal Resistance Ω	Notations	Ordering Number	Price
a2FB(**)	2	0.14	Track Relay	56001-663-07	$ 2,768.00
2FB(**)	10	200	Line Code Repeater	56001-672-01	$ 2,150.00
4FB(**)	10	80	Line Code Repeater	58640-172-03	$ 3,195.00
2F(***)-2B(**)	10	200	Line Code Repeater (*)	58640-172-01	$ 3,566.00
2FB(**)-2FB(***)	12	80	Line Code Repeater	58640-171-04	$ 2,669.00
2FB(**)	10	300	TRAKODE (Line Relay) (*)	58640-179-22	$ 3,595.00
2NR(**)	2	26.0-26.0	Polar-Stick Relay (*)	56001-664-05	$ 2,295.00
4FB(***)	10	80	Line Code Repeater	58640-171-03	$ 3,211.00
2F(~~)	–	80	Used in Train Control Mechanism(*)	56001-679-06	$ 2,995.00
4NR(****)	–	34	Polar-Stick Relay	58645-172-04	$ 2,991.00
4NR(****)	–	500	Magnetic-Stick Relay	58645-172-05	$ 2,995.00
4NR(****)	–	7	Polar-Stick Relay	58645-172-06	$ 2,879.00
2FB(**)	–	10	Line Code Repeater	56001-672-02	$ 2,729.00
2FB(**)	10	60	Line Code Repeater to obtain delayed release	56001-674-01	$ 2,395.00
2NR(**)	–	520	Polar-Stick Ground Detector	56001-675-01(†)	$ 2,995.00

Note (*): Specific application relay
Note (**): Silver-Platinum contacts for 30v or less
Note (***): Tungsten contacts for over 30v
Note (****): Silver-Impregnated Carbon to Silver
Note (~~): Silver-Impregnated Carbon to Silver-Platinum
Note (†): Available with a shock indicator

For assistance in ordering or requesting further information on Type B1Code Responsive Relays, please contact the ALSTOM Customer Service Center 800-717-4477



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Type B1 Switch-Overload
Neutral Relay (Direct Current)

Features

- **Used to cut off energy when switch machine motor is overloaded**
- **Provides automatic resetting when current polarity is reversed**
- **Will permit repeated switch operation to try to dislodge obstruction**
- **Available for low or high voltage machines**

The **Switch-Overload** Relay is used to cut off energy when a switch machine motor is overloaded because of an obstruction, and to provide for automatic resetting when polarity of the control circuit is reversed. The relay picks up on the overload current and remains picked up until the current in the control circuit is reversed.

Built-in thermal slow-pickup characteristics prevent pickup on the normal current surges through the switch machine motor when starting. This feature permits repeated switch operation which may dislodge the switch obstruction causing the overload. The relay has make-before-break (MB) contacts with .030" (0.762mm) front contact openings. These relays are available for low- or high-voltage switch machines.

Ordering Information

Contacts	Nominal Resistance Ω	Switch Machine Oper. Voltage	Overload Rating Amperes	Ordering Number	Price
2FB(**) (MB)	.058-135	Low	18	56001-916-02	$ 995.00
2FB(**) (MB)	.058-135	High	12	56001-916-01 (†)	$ 899.00
2FB(**) (MB)	1.85-220	High	See Note *	56001-937-01	$ 1,795.00
2B(***)	.068-1225	High	12	56001-785-01	$ 700.00
2FB(**) (MB)	.058-530	High	12	56001-943-01	$ 749.00
2FB(**) (MB)	.068-220	High	11.5	56001-785-21(†)	$ 764.00

Note (*): Requires resistor ordering no. 59671-002-01, for 7.5A operation or resistor ordering no. 59671-002-02, for 10A operation. Please order separately.
Note (**): Silver-Impregnated Carbon-Silver Front Contacts
Note (***): Silver-Silver Contacts
Note (†): Available with a shock indicator

For assistance in ordering or requesting further information on Type B1Switch Overload Relays, please contact the ALSTOM Customer Service Center 800-717-4477

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Type B1 Switch-Control Relay
(Direct Current)

Features

- **Available either as a neutral relay with heavy duty contacts or a biased-neutral relay with all or a combination of extra heavy-duty and medium duty safety contacts**
- **Used to control operating energy to switch machines**
- **All extra heavy duty contacts are silver-cadmium-oxide. Medium duty contacts are silver impregnated carbon to silver front and silver to silver back**

Ordering Information

Contacts	Nominal Resistance Ω	Switch Machine Operating Voltage	Maximum Pickup and Working Amperes	Notations	Ordering Number	Price
4FB	500	Low	0.0136	Neutral Relay. HD contacts, .090"(2.286mm) front contact opening	56001-917-01	$ 559.00
2F-2B	500	Low or High	0.019	Biased-Neutral Relay. EHD contacts. .125 " (3.175mm) front contact opening	56001-926-01 (†))	$ 732.00
2FB-5F-1B	0.045-450	High	0.0315	Neutral Relay. HD contacts. .090" (2.28mm) front contact opening. For Model 6 Switch Machine control.	56001-785-99	$ 995.00
2F-1B-1FB	500	Low or High	0.019	Biased Neutral Relay. 2F-1B are EHD contacts. .125" (3.175mm) Front contact openings. 1FB are medium duty contacts.	56001-988-01	$ 695.00

Note (†) : *Available with a shock indicator*

For assistance in ordering or requesting further information on Type B1Switch Control Relays, please contact the ALSTOM Customer Service Center 1-800-717-4477.

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Type B1 and B2 Neutral Normal Release Relay (Direct Current, Line and Track)

Features

- **Neutral Relays have normal pickup and release times, and are called "regular-release" relays**
- **Relays may be energized by current of either polarity**
- **A variety of neutral relays are available to meet a wide range of circuit requirements**

Ordering Information

Relay Size	Contacts	Nominal System Resistance Ω	Max Pickup and Working Amperes	Notations	Ordering Number	Price
B1	6FB	1.8	0.13	Track Relay	56001-714-03	$ 695.00
B1	6FB	4	0.089	Track Relay	56001-714-01	$ 675.00
B1	6FB	500	0.0121	Line Relay	56001-762-02	$ 580.00
B1	4FB-2F-1B	4	0.089	Track Relay	56001-787-01	$ 690.00
B1	4FB-2F-1B	500	0.0121	Line Relay	56001-783-02	$ 590.00
B1	6FB	84	0.0195	Line Relay	56001-785-31	$ 765.00
B1	6FB	900	0.0084	Line Relay	56001-762-01	$ 620.00
B1	6FB(*)	500	0.0157	Line Relay	56001-951-01	$ 706.00
B1	4F-2B	350	0.0086	Line Relay	56001-789-05	$ 725.00
B1	4FB-2F-1B	84	0.0195	Line Relay	56001-785-37	$ 795.00
B1	4FB-2F-1B	900	0.0084	Line Relay	56001-783-01	$ 590.00
B1	4FB-2F-1B	350	0.0136	HD contacts (silver backs)	56001-822-06	$ 620.00
B1	4FB-2F-1B	500	0.0121	HD contacts (silver backs)	56001-822-02	$ 590.00
B1	4FB-2F-1B	900	0.0084	HD contacts (silver backs)	56001-822-01(†)	$ 795.00
B1	2FB-3F-2B	42/1.6	0.043	Operated from master transformer	56001-785-15	$ 995.00
B1	6FB	9	0.055	Operated from decoder unit.	56001-785-12	$ 799.00
B1	4FB-2F-1B	29.5/20.5	0.037	Pulse bridging.Rectifier required 00400-004-01	56001-872-01	$ 795.00
B1	4FB	6	0.116	Overlay track circuits	56001-785-91	$ 689.00
B1	4F-2B	100	0.0157	Overlay track circuits	56001-789-03	$ 710.00
B1	4FB-2F-1B	100	0.0192	V P I	56001-787-05	$ 620.00
B1	6FB	60	0.033	Line Relay	56001-762-04	$ 635.00
B1	2FB-1B-2F	500	0.0158	EHD on 2F contacts	56001-881-01	$ 699.00
B1	4F-2B(*)	1	2.3	Intermittent train control	56001-931-02	$ 599.00
B1	6FB	500	0.012	HD front & back contacts	56001-978-01	$ 695.00
B1	2F-1B	1400	0.0315	LINE RELAY	56001-911-01(†)	
B1	6FB	500	0.0157	.4FB(*)	56001-983-01(†)	
B2	12FB	500	0.0152	Line Relay	56002-703-01	$1,995.00
B2	8FB-2F	330	0.0294	EHD on 2F contacts	56002-710-01	$1,995.00

*Note *: Heavy Duty Silver-cadmium oxide fronts and backs*

Note (†): Available with a shock indicator

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Type B1 and B2 Neutral Slow-Acting Relay (Direct Current)

Features

- **In slow-release and slow-pickup relays, the time delay is determined by copper or aluminum slugs or copper washers on the cores**
- **The time of release is the time required to open the front contacts after energy is removed from the relay**
- **Time of pickup is the time required to close the front contacts after energy is applied to the relay**

Ordering Information

Relay Size	Characteristics	Contacts	Nominal Resistance Ω	Max Pickup and Working Volts/Amps	Minimum Time of Pickup and/or Release	Ordering Number	Price
B1	Slow-Pickup	4FB-2F-1B	300	0.034A	1.4 sec at 13.2V	56001-790-01	$ 1595.00
B1	Slow-Pickup	6FB	220	9.45V	1.35 sec at .050A	56001-736-01	$ 995.00
B1	Slow-Release	4FB-2F-1B	194	0.046A	0.9-1.0 sec release at 10V	56001-851-01	$ 870.00
B1	Slow-Release	2FB	460	0.014A	3-3.75 sec at 9V	56001-830-01	$ 699.00
B1	Slow-Release	4FB	450	0.013A	0.9-1.1 sec at 10V	56001-808-26	$ 769.00
B1	Slow-Release	4FB	194	0.031A	3.0-3.75 sec at 12V	56001-774-01	$ 795.00
B1	Slow-Release	4FB-2F-1B	194	0.035A	1-1.25 sec at 10V	56001-792-02	$ 690.00
B1	Slow-Release	4FB-2F-1B	194	0.0335A	2.8-3.5 sec at 10V	56001-778-01	$ 850.00
B1	Slow-Release	4FB-2F-1B(**)	194	0.0347A	1.0-1.25 sec at 10V	56001-957-01	$ 995.00
B1	Slow-Release	6FB	194	0.035A	1-1.25 sec at 10V	56001-780-01	$ 632.00
B1	Slow-Release	4FB(**/***)	194	0.0315A	3-3.75 at 12V	56001-960-01	$ 729.00
B1	Partial, Slow-Rel.	2FB	24	0.023A	Approximately 0.4 sec.	56001-904-01	$ 699.00
B1	Slow-Release	4FB-2F-1B	300	0.0283A	1.7-2.1 sec. at 8.4V	56001-817-01	$ 902.00
B1	Slow-Release	4FB-2F-1B	800	0.121A	0.9-1.1 sec. at 10V	56001-792-01	$ 650.00
B1	Slow-Release(*)	4FB-2F-1B	460-460	0.036A	0.8-0.9 sec. at 21.6V	56001-785-85	$ 895.00
B1	Slow-Release	2F-4B	80	0.0242A	0.1-0.125 sec at 2V	56001-759-01	$ 699.00
B1	Slow-Release	2FB-4F-2B(*)	460	0.022A	2.0-2.5 sec at 32V	56001-950-01	$ 750.00
B1	Partial, Slow-Rel.	4FB(3)	210	0.0109A	Approximately 0.15 sec	56001-886-01	$ 895.00
B1	Slow-PU & Rel.	4FB-2F-1B	124	0.070A	1.5 sec release @ 11V	56001-785-80	$2,431.00
B2	Slow-Release	12FB	260	0.0231A	0.825-1.1 sec at 10V	56002-722-01	$2,695.00

Note (*): Lower coil only
Note (**): Silver-Impregnated Carbon backs
Note (***): Heavy Duty Contacts

For assistance in ordering or requesting further information on Type B1 and B2 Neutral Slow-Acting Relays, please contact the ALSTOM Customer Service Center800-717-4477

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Type B2 Code Transmitter Relay
(Direct Current)

IMPORTANT
KEEP ROTOR LOCKED AT ALL TIMES DURING HANDLING AND SHIPMENT. VIOLENT OSCILLATION OF ROTOR WILL DISTURB CONTACT ADJUSTMENT

Features

- **Available in code rates of 50, 75, 120, 180, 220, 270, or 333.3 ppm**
- **Have contact arc supressor which also eliminates radio interference**
- **Typical Application**
- **See page 20, 21, 72, 73 for our new Electronic Solid State Code Transmitter Relay**

Code Transmitter Relays have an oscillating armature on a vertical shaft carrying cams which open or close contacts in field circuits. A contact interrupts the energy to the driving coil to keep the armature oscillating. Other contacts interrupt circuits at a rate for which the transmitter is designed. Contacts are metal to metal.

Ordering Information

Contacts	Nominal Code Rate	Nominal Resistance Ω	Nominal System Voltage	Ordering Number	Price
2F-2B(*)	75	150	10	57490-095-05	$ 3,556.00
2F-2B(*)	180	150	10	57490-097-04	$ 3,521.00
2F-2B(*)	270	150	10	57490-098-01	$ 3,614.00
2F-2B(**)	75	150	10	57490-091-05	$ 3,632.00
2F-2B(**)	120	150	10	57490-092-01	$ 3,554.00
2F-2B(**)	180	150	10	57490-093-01	$ 3,632.00
2F-2B(**)	270	150	10	57490-094-01	$ 3,632.00
2F-2B(*)	75	150	10	57490-080-01	$ 3,621.00
1F-1B(*)	220	150	10	57490-119-02	$ 3,385.00
2F-2B(*)	50	150	10	57490-121-01	$ 3,395.00
2F-2B(*)	333.3	150	10	57490-010-04	Call for Price

Note (*): Silver-Platinum contacts for 30v or less
Note (**): Tungsten contacts for over 30v

For assistance in ordering or requesting further information on Type B2 Code Transmitter Relays, please contact the ALSTOM Customer Service Center 800-717-4477

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Type B2 Vane, Two-Position AC Track Relay

Features

- **Used mainly for track circuits**
- **Operates on low wattage**
- **High efficiency**
- **Two position**
- **Jewel bearings**
- **Aluminum alloy vane**

Alternating - Current **Vane** Relays are made principally for track circuits. They are high efficiency relays requiring low wattage in the track element for operation. A vane of aluminum alloy, specially annealed to prevent warping, is secured to a horizontal shaft. The shaft is supported at the ends by steel pivots rotating in jewel bearings to position the vane in the air gap between two magnetic field structures - one from the local source and one from the track signal. The electromagnets are constantly energized while the relay is picked up, but the magnetism produced by one of the electromagnets lags in time with respect to the other. The reaction on the vane of the two independent magnetisms, which are out of step, produces rotation. Pushers of insulated material transmit the movement of the vane shaft to the contacts. These contacts are similar to the ones used in DC relays, being flat springs molded in a phenolic block. Front contacts are silver-impregnated carbon to silver. Back contacts are silver to silver. The local coil is double-wound so that the two windings can be hooked up in series or in multiple. When connected in multiple, they are operated on half-voltage, and it becomes possible to connect a phase-shifting device, should track operating conditions make it necessary. Track windings are furnished the same way. All Vane Relays come with a shock indicator attached to the relay cover. The shock indicator will give a clear and non-reversible indication when relay is subjected to a shock or vibration in excess of its rating.

Ordering Information

Contacts	Local Winding Volts	Track Winding Volts	Frequency (Hz)	Ordering Number	Price
2F-2B	110/55	1.0/0.5	50	56005-100-08	$ 2,259.00
2F-2B	110/55	1.0/0.5	60	56005-100-09	$ 2,176.00
4F-4B	110/55	1.0/0.5	60	56005-100-01	$ 2,705.00
4F-4B	110/55	2.0/1.0	100	56005-100-20	$ 2,595.00
2F-2B	110	5	60	56005-100-18	$ 2,262.00
2F-2B	110	5	50	56005-100-21	$ 2,176.00

For assistance in ordering or requesting further information on Type B2 Vane Relays, please contact the ALSTOM Customer Service Center 800-717-4477

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Solid State Code Transmitter Relay

Features

- **Direct replacement of ALSTOM electromechanical code transmitter relays**
- **Lower Life Cycle Cost: No mechanical adjustments or periodic inspections needed**
- **Vital microprocessor based design**
- **Internal or External rate selection**
- **Built-in diagnostics**
- **Available in low and high voltage versions**

The **Solid State Code Transmitter (SSCT)** is a vital code rate transmitter that combines microprocessor technology with vital software and circuits to achieve an outstanding level of safety and reliability coupled with a maintenance-free design. The SSCT is capable of generating seven commonly used code rates, thereby reducing the number of types of units a user needs to stock. The SSCT design is based on the premise that any component degradation or failure (hardware and/or software) will not produce a code rate other than the rate selected. Should the unit detect a failure, or the input power drop below the minimum requirements, code rate generation is halted and the unit is reset. A minimum of two-second vital delay period follows every reset so that a sequence of starting and resetting does not appear as a valid code rate. A LED indicates when the unit is executing the two-second delay. SSCT is available in two rate configurations, fixed or universal. In the fixed configuration, the unit generates a single rate. In the universal configuration, when not installed, the transmitter is in a "non programmed" state. To select a code rate, a single wire jumper is added to the wiring side of the B2 plugboard. When the unit is installed, it becomes "programmed" by the jumper to generate one of the rates. A light-emitting diode (LED) indicated at which rate the generator is operating. The SSCT is powered from a DC supply, the allowable input voltage can range from 8 VDC to 16 VDC. At the nominal 12 VDC input the unit draws .30 ampere. The unit is protected from damage by the application of reverse voltage. Four solid state circuits emulate the contacts of the mechanical code transmitter. A LED indicates which set of contacts is closed at any given time. The output circuits ("contacts") are available in two configurations, low voltage or high voltage.

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Solid State Code Transmitter Relay

Configurations

The SSCT is available in 16 separate configurations. A unique part number designates each configuration. The group number defines the method of rate selection (fixed or externally selected), the rates available for that configuration, and whether the output circuits are designed for low voltage or high voltage operation.

Ordering Number	Rate	Low Voltage	High Voltage	Replaces These CT Relays
31750-100-01	EXT*	x		None
31750-100-02	EXT*		x	None
31750-100-03	50 Fixed	x		57490-121-01
31750-100-04	50 Fixed		x	57490-122-01
31750-100-05	75 Fixed	x		57490-080-01, -10 and (57490-095-01, -05 different registration)
31750-100-06	75 Fixed		x	57490-091-05,-06 and (57490-080-02 different registration)
31750-100-07	96 Fixed	x		57490-080-07, -09
31750-100-08	96 Fixed		x	57490–080-08
31750-100-09	120 Fixed	x		57490-096-01, -04
31750-100-10	120 Fixed		x	57490-092-01
31750-100-11	180 Fixed	x		57490-097-01, -04
31750-100-12	180 Fixed		x	57490-093-01
31750-100-13	220 Fixed	x		57490-119-01, -02 (Relay Only Had 1F-1B)
31750-100-14	220 Fixed		x	57490-111-01 (Relay Only Had 1F-1B)
31750-100-15	270 Fixed	x		57490-098-01
31750-100-16	270 Fixed		x	57490-094-01

*50, 75, 96,120, 180, 220, 270 rate externally selected with a plugboard jumper

Specifications

Data	Value
Code rate accuracy	± 2% stability with temperature and power supply variations is better than ± 0.1%
Operating temperature range	-40°C to +70°C.
Rate configurations	Fixed or universal
Code rates	50, 75, 96, 120, 180, 220 or 270
Power	DC supply, 8 VDC to 16 VDC
Solid Stae Output Circuits 2F and 2B	Low voltage (42 VDC @ 5.6ADC/30VRMS @4ARMS) or high voltage (220 VDC @ 2 ADC/220VRMS @ 2 ARMS)

Ordering Information

For assistance in ordering and specification of the ALSTOM Solid State Code Transmitter, please contact the ALSTOM Customer Service Center at 800-717-4477

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Microchron® II Vital Timer (DC)

Features

- **Uses solid-state components**
- **Consists of a vital timer and a vital relay structure**
- **More flexible than electro-mechanical timers**
- **Direct replacement for B2 Motor Timers and KB Motor Timers**
- **Uses Built-In Safety Assurance Logic vital software**

The **MICROCHRON® II Vital Timer** is a cost-effective solution for applications requiring a vital time delay. The unit features a wide voltage range and selectable time range which eliminate the need to stock separate timers with different input voltages and time ranges. One unit does it all. The MICROCHRON II Timer uses solid-state components and a vitally programmed microprocessor to electronically energize a vital neutral relay at a preset time interval. The vital timer and vital relay structure are contained within a standard Type B2 Relay enclosure. This enclosure may be rack-, wall- or shelf-mounted. The vital neutral relay structure within the unit includes two series connected coils and two front-back contacts (silver impregnated carbon, silver-silver), three fronts (silver impregnated carbon to silver) and two backs (silver to silver-impregnated carbon). With these additional contacts, the Microchron II offers more application flexibility than traditional electromechanical timers. The contact configuration also permits direct "plug-in" replacement of GRS Type B2 and KB DC motor timers where circuitry allows. Vitality is ensured through the use of built-in Safety Assurance Logic software which continuously verifies the microprocessor's functionality. This extremely reliable software has been used in fail-safe applications around the world since 1981. The Microchron Vital Timer Relay, introduced in 1981, is a blend of a traditional B1 vital relay design with a vital microprocessor timer function to produce a single design in a B2 package that replaces many earlier versions of electromechanical vital timer relays.

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Microchron® II Vital Timer (DC)

Features

- **Wide Voltage Range**
  The MICROCHRON II Timer has a wide input operating range of +8Vdc to +31.5Vdc.

- **Simple, 1 Second Time Delay Adjustment**
  A tactile thumbwheel provides precise time settings in easy-to-read 1 second increments. Time delays may be set from 1 second to 19 minutes and 59 seconds. There is no need to convert switch positions or gear markings into minutes or seconds.

- **Tamper-Evident Time Setting Seal**
  A special translucent seal is affixed over the time setting thumbwheel. Any attempt at tampering with the time setting requires the removal of the seal, which results in a visible "VOID" indication.

- **Lead Seal Option**
  The Microchron II can be ordered with a lead seal over the time setting thumbwheel instead of the translucent seal.

- **Fail-Safe Performance**
  Rigid safety standards are maintained through the use of logic controls within the timer. Safety Assurance Logic software continuously verifies timer functions in a serial manner.

- **Simple Installation**
  The timer may be rack-, wall- or shelf-mounted. It is plug-compatible with Type B2 and KB electro mechanical DC-timer relays as well as earlier version MICROCHRON units.

Specifications

Data	Value
Application	Switch Lock Release, Highway-Crossing Monitoring, Timed Release of Approach Locking
Accuracy	±0.1% of time setting (plus a turn-on delay of 500ms max.)
Time Range	1 second increments, 19 minutes, 59 seconds maximum, 1 second minimum
Temperature Range	-40°C to +70°C
Humidity	0 to 100% (non-condensing)
Dimensions	Height 6.3"(16.03 cm), Width 4.9"(12.54 cm), Depth(without plugboard) 7.6"(19.37 cm) Depth(with plugboard) 9.0"(22.86 cm), Weight 7.8 lbs. (3.55kg)

Ordering Information

Description	Ordering Number	Price
MICROCHRON II Timer	50800-101-01	$1,641.00
MICROCHRON II Timer with lead seal option	50800-101-02	$1,801.00
Plugboard Kit	59686-007-12	$ 195.00

For assistance in ordering or requesting further information on the Microchron II Vital Timer Relay, please contact the ALSTOM Customer Service Center 800-717-4477

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Microchron® II Vital Timer (AC)

Features

- Simple time delay adjustment
- Replaces AC Motor Timers via a common registration plate
- Interruption of power causes the unit to reset timing interval
- Accuracy is + 0.1% of time setting (plus a max. delay of 0.75 sec.)
- Timing range from 1 second to 19 minutes 59.9 seconds
- Time settings in 0.1 second increments
- Shock Indicator on Cover

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Microchron® II Vital Timer (AC)

The **AC Microchron II Timer Relay** is a microprocessor controlled vital timing relay mechanism consisting of a solid-state timing package and a vital neutral relay assembly housed within a B2 relay enclosure which plugs onto a B2 plugboard. The timer module contains a microcontroller and Complementary Metal Oxide Semiconductor (CMOS) technology integrated circuits. Positioning of five thumbwheel rotary switches sets the appropriate time. After timing out, a tuned vital driver circuit drives the B1 Neutral relay. The relay remains energized until power is removed from the unit. Designed to replace existing AC motor timers, it possesses a 1.0 second to 19 minute and 59.9 second delay range. Delay is initiated once input power is applied. There are two versions of this unit . One version operates at 60 Hz and the other version operates at 25 Hz. The primary components of the timer relay are the same for both versions. The vital relay structure of the unit has two series-connected coils. The contacts include one front-back (silver impregnated-carbon to silver and silver to silver), three fronts (silver impregnated-carbon to silver), and one check circuit contact (silver to silver).The unit contains two circuit boards, the Thumbwheel Switch Board and a Timer Processor Board. The Thumbwheel Switch Board contains a five-section thumbwheel switch to set the time and an AC to DC converter circuit. The Timer Processor Board contains a vitally programmed 8-bit microcontroller, low voltage shutdown and reset/watchdog integrated chip, DC to DC converter, secondary reference clock and vital relay driver. The Timer Processor Board interfaces with the Thumbwheel Switch Board through a PC edge connector. The four-wire connector on the Thumbwheel Switch Board is used to provide AC power to the AC to DC converter (two wires), and route unregulated DC power to the Timer Processor Board (two wires).

The AC Microchron II Timer Relay can replace the following AC Motor Timer Relays:

AC Microchron	AC Motor Timer
60 Hz Relay (50800-103-01)	56007-050-01, 56007-051-01, 56007-060-01, 56007-061-01, 56007-066-01, 56007-067-01, 56007-067-02, 56007-068-01, 56007-068-02
25 Hz Relay (50800-104-01)	56007-062-01, 56007-063-01, 56007-065-01, 56007-069-01, 56007-070-01

Ordering Information

Description	Ordering Number	Price
AC Microchron II 60 Hz	50800-103-01	$2,300.00
AC Microchron II 25 Hz	50800-104-01	$3,900.00

For assistance in ordering or requesting further information on the AC Microchron II Vital Timer Relay, please contact the ALSTOM Customer Service Center 800-717-4477

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Plugboard Kits and Contact Groups For Types B1, B2 & Microchron Relays

Ordering Information for Plugboard Kits

Description	Ordering Number	Price
PLUGBOARD KIT, for all Type B, Size 1 Relays, includes insulators; solder terminals; relay mounting studs with nuts and washers; plugboard; test post; mounting bolts, nuts and washers. Does not include registration plates or voltage post	59686-005-01	$ 99.00
PLUGBOARD KIT, Same as Ref. A except has #16-20. AWG crimp type terminals	59686-005-05	$ 196.00
PLUGBOARD KIT, Same as Ref. A except has #10-14. AWG crimp type terminals	59686-005-04	$ 245.00
PLUGBOARD KIT, Same as Ref. A except without terminals	59686-005-08	$ 98.00
PLUGBOARD KIT, for all Type B, Size 2 Relays except B2 Vane and Microchron Timer includes insulators; solder terminals; relay mounting studs with nuts and washers; plugboard, test post, mounting bolts, nuts and washers. Does not include registration plates, voltage post, or terminal block	59686-007-01	$ 71.00
PLUGBOARD KIT, Same as Ref. B except for Type B2 Vane Relay	59686-007-02	$ 195.00
PLUGBOARD KIT, Same as Ref. B except has #16-20. AWG crimp type terminals	59686-007-06	$ 278.00
PLUGBOARD KIT, Same as Ref. B except has #10-14. AWG crimp type terminals	59686-007-04	$ 261.00
PLUGBOARD KIT, Same as Ref. B except without terminals	59686-007-10	$ 111.00
PLUGBOARD KIT, Same as Ref. B1 except has #16-20, AWG crimp type terminals	59686-007-07	$ 243.00
PLUGBOARD KIT, Same as Ref. B1 except has #10-14. AWG crimp type terminals	59686-007-05	$ 221.00
PLUGBOARD KIT, Same as Ref. B except for Microchron Timer Relay	59686-007-12	$ 139.00
PLUGBOARD KIT, Same as Ref. B7 except with #16-20. AWG crimp type terminals	59686-007-14	$ 207.00
PLUGBOARD KIT, Same as Ref. B1 except without terminals	59686-007-16	
Terminal Block (2 Post), to mount on back of plugboards	46048-053-01	
Scew, to mount terminal block	07608-224-ON	

Ordering Information for Contact Groups

Combination	Front Contacts	Back Contacts	Ordering Number	Price
2FB	AgC to S (MD)	S to S (MD)	56012-108-06	$ 129.00
2FB	AgC to S (HD)	S to S (HD)	56012-108-09	$ 159.00
2FB (*)	SCdO to SCdO (HD)	SCdO to SCdO (HD)	56012-108-40	$ 195.00
2F-1B	AgC to S (MD)	S to S (MD)	56012-108-02	$ 150.00
2F-1B	AgC to S (HD)	S to S (HD)	56012-108-03	$ 150.00
1F-2B	AgC to S (MD)	S to S (MD)	56012-108-05	$ 150.00
2B	-	S to S (HD)	56012-108-25	$ 384.00
1F-1B	AgC to S (EHD)	S to S (EHD)	56012-108-12	$ 142.00
1F-1B (**)	SCdO to SCdO (EHD)	SCdO to SCdO (EHD)	56012-108-13	$ 189.00
2FB	AgC to S (HD)	S to AgC (HD)	56012-108-07	$ 143.00
2F-1B	AgC to S (HD)	S to AgC (HD)	56012-108-04	$ 150.00

Legend
AgC to S= Silver-Impregnated Carbon to Silver
HD = Heavy-Duty
MD = Medium Duty
EHD = Extra Heavy-Duty, with magnetic blowouts
SCdO = Silver Cadmium Oxide

Note (*): Minimum current rating is 0.300 amps for reliable contact operation.
Note (**): Specify drawing number of relay on which contact group will be used so magnets can be magnetized and assembled correctly.

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Commonly Used Parts, Tools, and Kits

Commonly Used Parts

Description	Ordering Number	Price
VOLTAGE TEST POST COMPLETE, includes screw, nuts, washers and eyelet, for opening coil circuit	42788-001-02	$ 15.00
CURRENT TEST POST COMPLETE, includes screw, nuts, washers and connector, for opening coil circuit	42788-001-01	$ 30.00
TERMINAL, solder type, two required per insulator	55871-019-00	$ 5.00
TERMINAL, crimp type for #16 - 20 AWG wire, two required per insulator	55871-074-00	$ 5.00
TERMINAL, crimp type for #10 - 14 AWG wire, two required per insulator	55871-098-00	$ 5.00
INSULATOR, for holding terminal in position on plugboard	55862-024-00	$ 5.00
NUT, knurled, for holding relay to plugboard	00846-029-00	$ 5.00
STUD	48813-006-00	$ 6.00
Nut, for locking nut	01472-008-00	
Washer, flat .266" ID, .500" O.D., .031" THK	56022-049-00	
Nut, .250" -28 hex., elastic stop	42333-065-00	
Terminal Block Complete	46048-053-01	
Screw, .164" -32 x .75" Lg. Slotted pan head self tapping	07608-224-ON	
Washer, internal tooth lock .164" ID, .340" OD, .023" THK	53029-068-00	
Sleeve, rubber, insulating	35189-033-00	
Wrap Around Wire Tags, for B1 Relays, columns 1-3	59539-405-00	
Wrap Around Wire Tags, for B2 Relays, columns 4-6	59539-406-00	

Commonly Used Tools and Kits

Description	Ordering Number	Price
B Relay Tool Kit Minimum adjustment tools/gauges required to re-adjust B1 & B2 neutral and biased-neutral relays (*)	59649-206-01	
Extractor, for plugboard terminal (*)	59688-000-00	
Gauge, Pronging, for checking alignment gap, use with: (**)	56260-014-01	
Gauge Indexer (For B1 Relays) (**)	56560-008-01	
Gauge Indexer (For B2 and Vane Relays) (**)	56560-010-01	
Gauge, step .033- .040- .140- .118- .113-, for setting bridge travel and makes/breaks for .125 inch front contact opening relays (**)	36183-064-00	
Gauge, step .033- .040- .120- .098- .093-, for setting bridge travel and makes/breaks for .125 inch front contact opening relays (**)	36183-065-00	
B Relay Terminal Hand Crimp Tool, for AWG. 10-20 Wire (*)	24745-148-00	
B Relay Contact Burnishing Tool (**)	55411-003-00	
Spanner Nut Wrench for B Relay 3E Post (*)	55393-003-01	

Note (*): Signal Maintainer Tool
Note (**): Shop Tool

For assistance in ordering or requesting further information on plugboards, parts and contact groups for B2 Relays, please contact the ALSTOM Customer Service Center 1-800-717-4477

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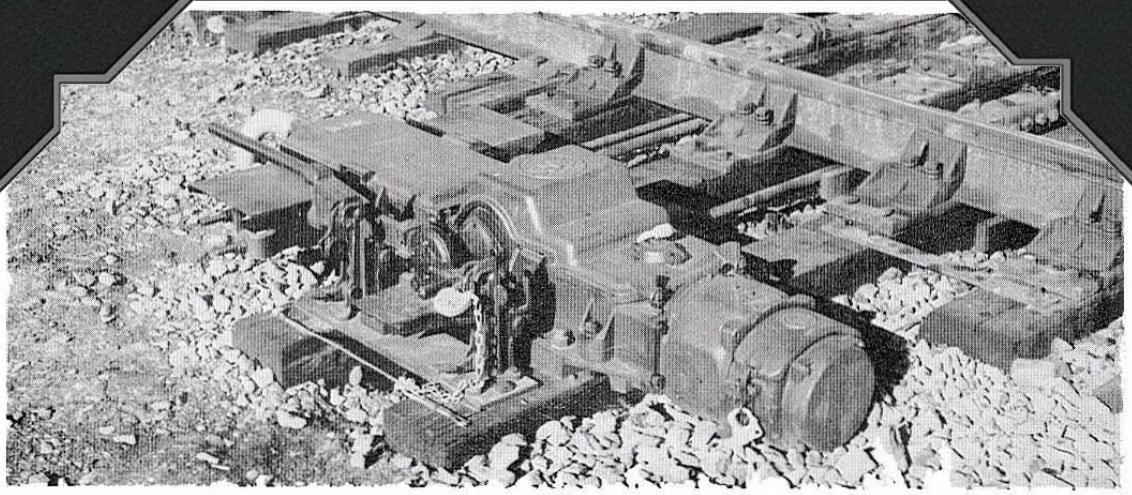


Model 5F Switch Machine

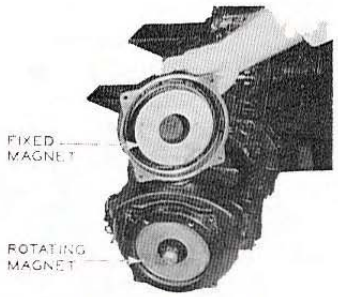
NEW IMPROVED

electric switch machines GRS Model 5E and Model 5F

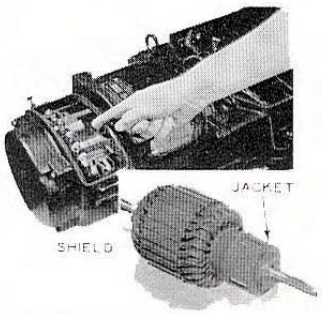
The new GRS Models 5E and 5F switch machines are improved versions of the Models 5C and 5D. They give you all the advantages of these time-tested machines, plus easier maintenance and designed-in frost protection without the use of energy-consuming heaters.

The Model 5F is a dual-control (power hand) machine, like the Model 5D. The Model 5E machine is designed for power operation only, like the Model 5C machine.

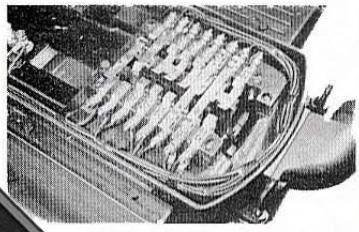
Models 5E and 5F are available in two ranges of operating voltage: 24-32 volts d.c. and 110 volts d.c. Suitable for all types of interlocking and remote-control, they meet all A.A.R. requirements.



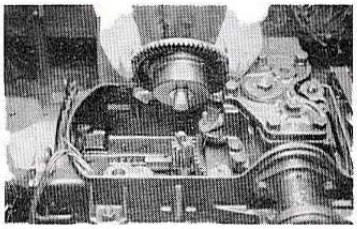
MAGNETIC-FLUX BRAKE holds shaft after snub circuit stops motor. High-energy Indox ring magnets give powerful magnetic detent. No mechanical contact between brake elements—no freezing, no wear, no maintenance.



COMMUTATOR is completely protected against frost. A silicone-treated moisture-repellent jacket wipes the commutator surface. A shield deflects any condensation drip. Shield is transparent to permit visual inspection of brushes.



RCUIT CONTROLLER has knife- frost-cutting contacts with 3½-pound pressure and long Motor-control contacts are or long life.



ACCESSIBLE CLUTCH. New design of gear train in Model 5F machine permits easy removal of clutch without disassembling dual-control mechanism.

GENERAL RAILWAY SIGNAL COMPANY

ROCHESTER 2, NEW YORK
NEW YORK 17 · CHICAGO 1 · ST. LOUIS

February 1960 Advertisment

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Section Contents

GM4000A™

TM100™ In–Tie

Model 6 Yard Machine

Model 5 Letter Series

Electric Switch Locks

Switch Circuit Controllers

Additional Switch Products

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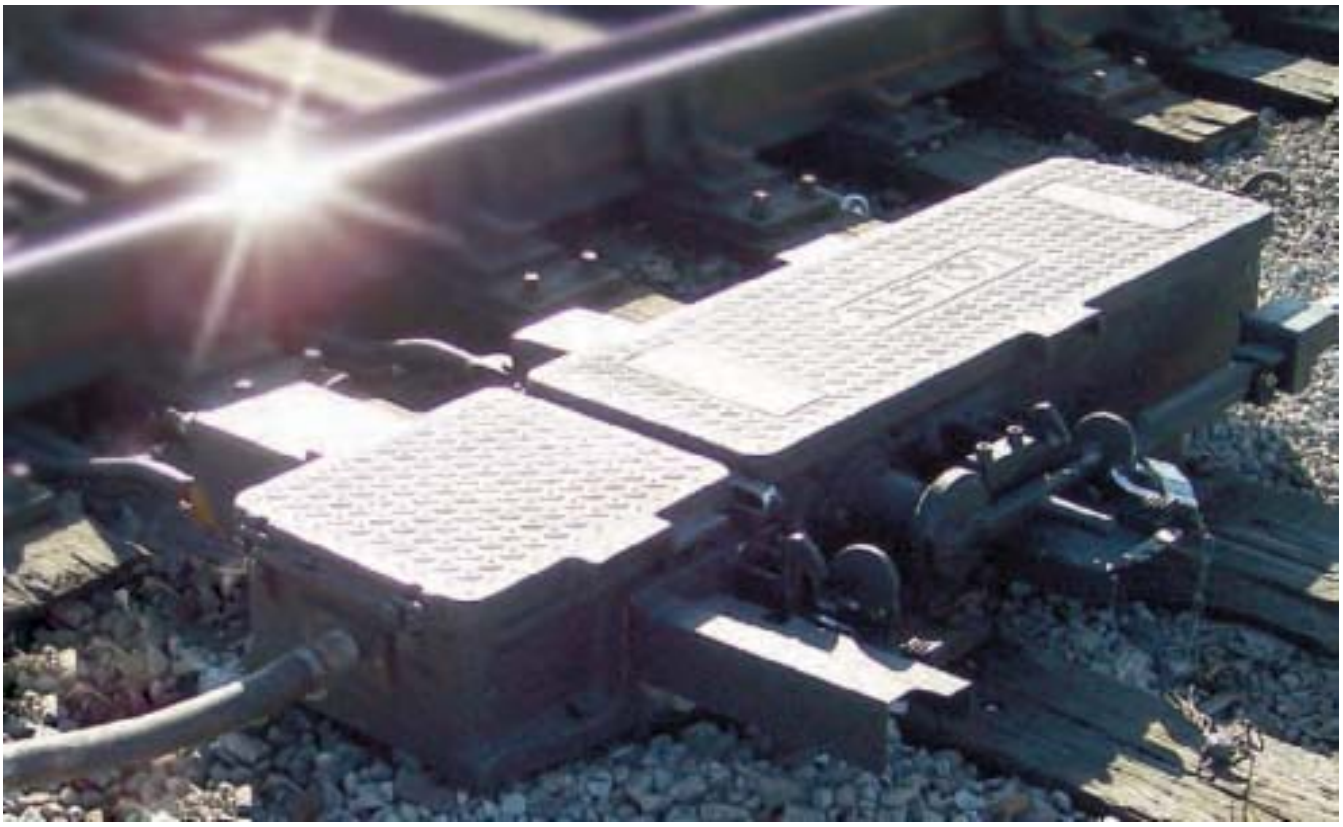
GM4000A™
Switch Machine



The **NEW GM4000A™** Switch Machine incorporates all of the features required to meet today's interlocking demands. The machine is easy to specify, operate, install and maintain. One model does it all! It is truly universal. There is no need to purchase different machines for different locations because this unit is a drop-in replacement for all industry machines. Large inventories of spare parts are reduced because of the GM4000A™ Modularity Design Concept. The machine uses 50% fewer parts than traditional switch machines and it is adaptable to nearly all site-specific requirements without having to make application or electrical changes. With a low 8¾" profile, the GM4000A ™ is especially well suited for applications with height restrictions. Having capability to deliver more than 4,000 lbf of thrust, this machine is an ideal solution for long turnouts, installations plagued by snow and ice or short turnouts with welded heel blocks. A maintenance free brushless servomotor eliminates worn brush replacements and the dynamic snubbing device. The machine's solid state controller eliminates a mechanical clutch, provides universal power (85 to 160Vac or 13 to 160Vdc), offers field configurable control (2, 3, 4 or 5 wire), and has and integrated five second overload protection that eliminates the need for overload relays. The point detection system indicates normal or reverse switch positions and breaks indication if a switch point has moved away from the stock rail. This system also includes a mechanical latch-out functionality that can be customer configured to restoring, non-restoring or disabled. Field obstruction testing and adjustments are simplified with the use of a spoon gauge. Floating of the lock rod for FRA monthly testing is now no longer needed. The machine is field configurable for single or dual control and right or left hand operation. Its universal footprint matches all industry standard hole patterns and requires no extra drilling at time of installation.

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Features

Advanced Drive Train

- Maintenance free gearbox, no lubrication required

Main Drive Module

- Single and dual control versions
- Hand throw and hand crank permits track switching without electrical power
- Low 8.75 inch low profile

Lock Rod Module

- Wide or narrow notch designs
- 3.5 to 6.5 inch adjustable throw
- Left or Right-hand Field Configurable

Accurate Point Detection System

- Indicates normal or reverse switch position
- Breaks indication if point moves away from stockrail
- Configurable for restorable and non-restorable latchout modes (Local vs. remote reset)

Split Link Cam Bar

- Prevents Lock Rod shaving
- Allows flagging over a fouled switch without damaging hand throw arm
- Permits throw bar to complete full stroke when lock rod is fouled

Optional Heaters

- 24V or 110V
- Available for terminal and/ or gearbox

Maintenance-Free Motor and Controller

- Brushless DC motor and solid-state controller
- No dynamic snubbing wire
- No magnetic detent
- LED fault indicators
- User selectable speed
- Current overload protection
- Electronic clutch
- Controller uses LED reference indicators and local control switches which eliminate the need for hand cranking
- Accepts both 24VDC and 110VAC or 110VDC; Universal Power

Integral Latch Stand Module

- Bolted directly to machine (No adjustment needed for tie shifting)
- Left or Right-hand Field Configurable
- Available with or without latch stands (GM4000 latch stands are compatible with the GM4000A machine)

Optional Maintainer Tool Kit

- Factory Grease
- Hex Head wrenches
- Spoon gauge

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GM4000A™
Switch Machine

Specifications

Data	Value
Applications	Single Switch, Single-slip Switch, Double-slip Switch, Derail, Frog
Layout	Field-configurable for left or right-hand throw
Control	Single or dual control
Mounting Requirements	Universal footprint. Matches all industry standard bolt patterns
Thrust	Maximum rated thrust 4,000 lbf (Maximum thrust requires 85V minimum, 4-second speed setting and high current setting)
Throw Bar Stroke	6.5 Inches (16.5 cm)
Overload Protection	No Overload Relays Needed
Dynamic Snubbing	Not required
Magnetic Detent	Inherent in machine
Hand Crank	Available for maintenance and emergency use
Machine Access	Rapid cover release and closure hasp
Control Scheme	2, 3, 4 or 5-wire
Control Voltage	8-36VDC
Weight	1,000 lbs.
Motor Type	Maintenance-free brushless
Operating Voltage	85 - 160VAC/DC, 13 - 160VDC, machine will operate at 50Hz, 60Hz or 100Hz AC
Operating Time	4 seconds at 110V AC, 15 seconds at 110V AC/DC, 15 seconds at 24VDC
Clutch Setting	Not required
Dimensions	Length: 67″ x Width: 41″ x Height: 8.75″

GM4000A Current Draw

	High Speed		Low Speed	
Nominal Voltage	Average Current	Peak Current	Average Current	Peak Current
110 VDC	2 A	14 A	0.3 A	4.4 A
24 VDC	1.5 A	17 A	1.5 A	17 A

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Ordering Information
GM4000A™ Configuation Key for Model Number Configuration

Code	MODEL NUMBER	WM
	CONTROL CONFIGURATION	
A	GMV00-000-01 Dual Control (Hand Throw with Hand Crank Capability)	
B	GMV00-000-02 Dual Control (Hand Throw w/o Hand Crank Capability)	
C	GMV00-000-03 Single Control (No Hand Throw with Hand Crank Capability)	
D	GMV00-000-04 Single Control (No Hand Throw with Hand Crank Capability, No Latch Out)	
	MACHINE ORIENTATION	
L	Left Hand	
R	Right Hand	
	LOCK RODS (4.5 to 6 inches stroke)	
N	GM050-300-01 Narrow Notch Threaded End	
W	GM050-300-02 Wide Notch Threaded End	
S	GM050-300-03 Narrow Notch Spade End	
B	GM050-300-04 Wide Notch Spade End	
C	GM050-300-05 Wide Notch Spade End	
X	No Lock Rod Add: Only (2) Covers GMV00-011-00	
Note	*For Lock Rods -01 to –05 Add: (4) GMV00-012-00, (2) GMV00-013-00 AND (2) GMV00-014-00*	
	POINT DETECTOR ROD (4.5 to 6 inches stroke)	
T	GM050-500-01 Swivel Threaded End with Rivets	
S	GM050-500-02 Solid Threaded End	
P	GMV00-500-03 Swivel Threaded End With Grease Pin	
C	GMV00-500-04 Swivel Threaded End With Grease Pin	
	CONTROLLER CONFIGURATION	
S	GMV00-043-00 Standard Controller	
E	GMV00-044-00 Enhanced Controller	
	GEAR BOX HEATER	
B	55290-040-00 (24VDC 110 VAC/DC) Gear Box Heater (1)	
N	No Gear Box Heater	
	CONDENSATION HEATERS	
A	55290-041-00 24 Volt Heater	
B	55290-042-00 110 Volt Heater	
C	Both Heaters	
N	No Condensation Heater	
	LATCH STANDS	
L	GMV00-400-01 (2) Required Per Machine	
N	No Latch Stands	
	TOOLS (Optional Accessories)	
B	All: Hand Crank, Spoon Gauge (.38/.25), and Tool Kit	
S	GMA50-002-00 Spoon Gauge (.38/.25)	
H	GMA50-012-00 Hand Crank	
E	GMA50-013-00 Hand Crank, Hex End And 50570-015-00 Ratcheting Crank	
C	GMA50-014-00 Spoon Gauge (6.0/4.5mm)	
K	GMK50-000-01 Maintainer Tool Kit	
P	GMA50-100-01Bushing Puller	
N	No Tools	
	HAND THROW LEVER LETTER KIT (Optional Accessory)	
K	GMK50-004-01 Letters “N” and “R”	
N	No Hand Throw Letter Kit	
	HARNESS ADAPTER OPTIONS	
A	GMK50-013-01 Single Switch Polarized Repeater Harness	
H	GMK50-010-01 Wire Harness Adapter For Motor End Wire Entrance	
N	No Harness Adapter	
	TEST CONFIGURATION	
A	24 Volt Operation	
B	110 Volt Operation	
C	Both 24 & 110 Volt Operation	

Each GM4000A is configured to meet your needs. Please refer to the configuration worksheet above, note the options you need and contact Customer Service at 1-800-717-4477 for further ordering information, pricing and delivery.

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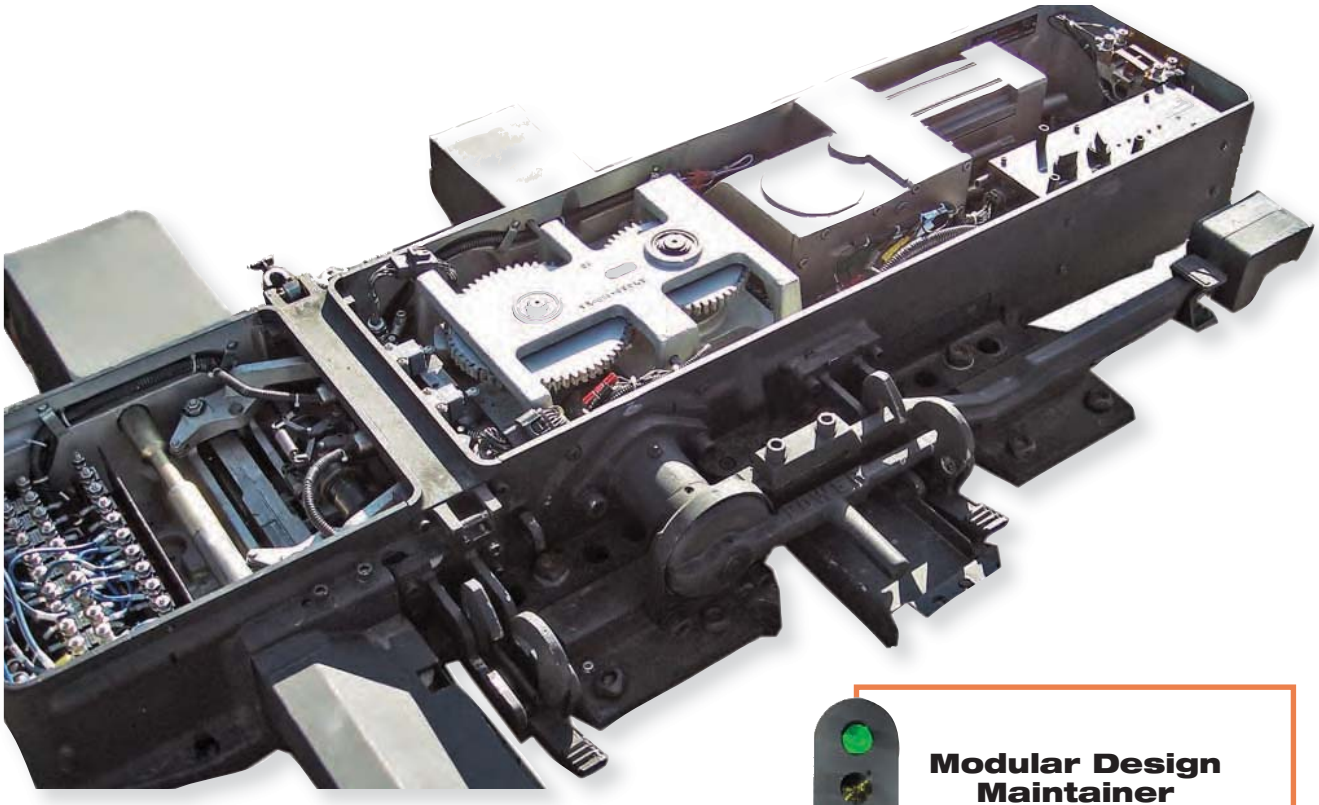
GM4000A™
Switch Machine



Modular Design
Maintainer
Friendly

Ordering Information - Accessories

Ordering Number	Description	Price
GMA50-010-00	Hand Crank	$ 99.00
GMA50-002-00	Spoon Gauge (Point Detector Adjustments)	$ 145.00
GMV00-012-00	Wear Plate, Side Lock Rod, four required	$ 30.00
GMV00-013-00	Wear Plate, Top Lock Rod, two required	$ 30.00
GMV00-014-00	Wear Plate, Bottom Lock Rod, two required	$ 40.00
GMV00-016-00	Wear Plate, Side Throw Bar, four required	$ 30.00
GMV00-017-00	Wear Plate, Top and Bottom Throw Bar, four required	$ 30.00
GMA50-003-00	Point Detector Rod Drop Lug	$ 115.00
GMA50-008-01	Adjustable Lock Rod Drop Lug (Threaded Lock Rod)	$ 715.00
GMA50-008-02	Adjustable Lock Rod Drop Lug (Spade End Lock Rod)	$ 520.00
GMA50-006-00	Throw Bar Coupler, straight	$ 177.00
GMA50-007-00	Throw Bar Coupler, downward set, 3.4"	$ 441.00
GMK50-000-01	Maintainer Tool Kit	$ 459.00
GMK50-003-01	Gear Box Heater Kit	$ 846.00
GMK50-012-01	Condensation Heater Kit, 24V	$ 150.00
GMK50-012-02	Condensation Heater Kit, 110V	$ 150.00
55494-017-00	Thermal Mat, Short Cover	$ 7.00
55494-018-00	Thermal Mat, Long Cover	$ 29.00
26674-025-00	Cycle Counter	$ 149.00

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GM4000A™
Switch Machine

GM4000A
Enhanced Controller

Maintainer Friendly

Ordering Information - Modules and Parts

Ordering Number	Description	Price
GMV00-042-00	DC Motor	$ 1,350.00
GMV00-100-01	Main Drive	$ 3,995.00
GMV00-043-00	Solid-State Controller, Standard	$ 1,995.00
GMV00-044-00	Solid-State Controller, Enhanced	$ 2,150.00
GMV00-200-01	Hand Throw	$ 2,000.00
GM050-300-02	Lock Rod, wide-notch, threaded end	$ 695.00
GM050-300-01	Lock Rod, narrow-notch, threaded end	$ 1,209.00
GM050-300-04	Lock Rod, wide-notch, spade end	$ 1,395.00
GM050-300-03	Lock Rod, narrow-notch, spade end	$ 1,599.00
GMV00-400-01	Latch Stand, two required	$ 299.00
GM050-800-02	Point Detector Switch	$ 1,305.00
GMV00-700-01	Point Detector Module	$ 1,495.00
GMV00-500-01	Point Detector Rod, swivel, threaded end	$ 350.00
GMV00-500-02	Point Detector Rod, solid, spade end	$ 300.00
GMV00-600-01	Cam Bar	$ 129.00
GMV00-900-01	Switch Machine Harness with gear box heaters	$ 950.00
GMV00-900-02	Switch Machine Harness without gear box heaters	$ 1,695.00
GM050-002-00	Throw Bar	$ 848.00
GM050-132-01	Shifter Assembly (For Main Drive)	$ 745.00
GM050-131-01	Bevel Gear Assembly (For Main Drive)	$ 479.00
GM050-030-00	Guard, Throw-Bar Field Side	$ 59.00
GM050-029-00	Guard, Throw-Bar Track Side	$ 78.00
GM050-031-00	Guard, Lock Rod Track Side	$ 90.00
GM050-032-00	Guard, Lock Rod Field Side	$ 90.00
GMV00-007-00	Cover, Long	$ 300.00
GMV00-008-00	Cover, Short	$ 150.00

Note: Existing switch machine drop lugs and couplers will not interface with the GM4000A, new hardware needs to be ordered separately. For assistance in ordering or requesting further information on the GM4000A Switch Machine, please contact the ALSTOM Customer Service Center 800-717-4477

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TM100™
In-Tie Switch Machine

The **TM100™ In–Tie** Switch Machine is ALSTOM's newest addition to the Switch Machine product line. The TM100 was designed, engineered and manufactured utilizing ALSTOM's global resources and focusing on the reduction of Total Supply Chain Costs. The TM100 helps to reduce costs, parts inventory and maintenance of the product while maximizing operating profit through easier installation.

The TM100 features the latest in design technologies to deliver superior safety, reliability and performance. Its rugged design eliminates the need to continuously regulate adjustments of the points and, through a patented design achievement, thermal expansion effects of running rail to the switch machine are minimized. Since the TM100 is directly bolted to the stock rail, the necessity for layout rods is eliminated. The machine is also protected from mechanical overload damage by the use of an electronic time-out within the controller. The TM100's motor is a brushless, servo-type, which eliminates related brush maintenance, and no gear timing is needed.

The TM100 Switch Machine helps lower life-cycle costs and provides more operational consistency without compromising the demanding requirements of today's rail industry. Its unique dimensions allow for mechanical tamping which provides greater track stability and ensures higher quality of maintenance. The TM100 is the only In-Tie machine that can provide this peace of mind. Through its double-bolted connection to the stock rails and its lightweight, narrow design, the TM100 becomes integrated with the track structure. A bolted connection is essential to a quality "In-Tie" application.

ALSTOM has drawn on the experience and expertise gained from over a century in the Switch Machine business to ensure that our customers will receive the best value for their purchase. ALSTOM has evolved its switch machine product line from a purely functional product offering to a more responsive, life-cycle product offering which improves all areas of daily rail operations. Competitively designed, the TM100 is positioned to lead the Switch Machine market for all Freight, Transit, and Commuter applications.

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CALL 800.717.4477 • FAX 585.274.8777

TM100™
In-Tie Switch Machine

Features

- **No Rods, Gauge Plates, Clips, Basket, Lugs**
  Reduced construction costs & maintenance
- **Allows for Point "Rail Run"**
  Eliminates seasonal trouble calls
- **Machine Tampable**
  Reduces track pumping & maintenance
- **No Clutch & Brushless Motor**
  Less maintenance
- **Modular Components**
  Easy field repair
- **Limit Switches**
  No contact finger adjustments
- **No Lock System Adjustment**
  Easier installation, testing, & maintenance
- **No Headblock Ties Needed**
  Reduced construction costs
- **Internal Overload Protection**
  Reduced costs on overload relays
- **Cost Efficient**
  Significantly lower cost due to elimination of rods, gauge plates and special head block ties - layouts

- **Bolted Connection to Stock Rail**
  Reduced Loss of Correspondence

  Keeps Machine and Locking System from Shifting

  Unique to Industry
- **Use in freight, commuter and transit applications**
- **Available in 24 VDC and 110 VAC/DC**

No Layout Parts Required

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TM100™
In-Tie Switch Machine

Specifications

Data	Value
Applications	Single Switch
Rail Sizes	Universal
Control	Dual
Thrust	Adjustable: 500 to 4000 lbs.
Voltage	24 & 110 VDC
Current Draw	8-10 Amps
Control Wiring	3-Wire Mode
Temperature Range	-40° to 70° Celsius
Dimensions	Length = 110", Width = 12", Depth (from bottom of stock rail) = 9.25" Height = (from bottom of stock rail) = 6.80" (only on motor end)
Throw Time	110 DC = 3.5 seconds 24 DC =10 seconds
Weight	1000 lbs.
Point Opening	Adjustable: 4 to 6.25 Inches
Overload Protection	No clutch. Electronic time-out

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Ordering Information

Code	MODEL NUMBER TM100-
	MOTOR AND CONTROLLER MODULE
1	24 VDC
2	110 VDC
	STOCK RAIL ADAPTERS
1	For Rail Sizes 115#, 119#
2	For Rail Sizes 132#, 136#
3	For Rail Size 133#
4	For Rail Size 140#
5	For Rail Size 141#
	POINT ADAPTERS
1	Standard, Hole Spacing (1.5" 5" 3" 5")
2	Reduced, Hole Spacing (1.5" 5" 2.5" 5")
	POINT ADAPTER BOLTS
1	For Points with 1" Bolt Holes
2	For Points with ¾" Bolt Holes
3	Both 1' & ¾" Bolt Holes (Typical on 115/119# Points)
	JUNCTION BOX HOLE ADAPTER
0	NONE
1	For 1" Junction Box Holes
2	For 1½" Junction Box Holes
3	For 2" Junction Box Holes
	LIMIT SWITCH HEATERS
0	NONE
1	24 VOLT
2	110 VOLT
	CONTROLLER HEATERS
0	NONE
1	24 VOLT
2	110 VOLT
	METRIC TOOL KIT
0	NONE
1	YES
	CONTROLLER SOFTWARE & CABLES
0	NONE
1	YES
	SPARE PARTS KIT
0	NONE
1	YES (1-Motor/Controller Module & 4-Limit Switches)
	SPARE MAINTAINER HAND CRANK
0	NONE
1	YES
	CYCLE COUNTER
0	NONE
1	YES

Each TM100 is configured to exactly meet your needs. Please refer to the configuration worksheet above, note the options you need and contact Customer Service at 800-717-4477 for advice, pricing and delivery.

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Model 6
Yard Switch Machine

Features

- **High Speed Version (.6 sec) fastest available**
- **Exclusive trailing mechanism eliminates damage to machine, switch points, and fittings**
- **Versatile; for use in all yard applications, car classification, rapid transit, and industrial spurs**
- **Two speeds available**

Originally designed in the 1920's, ALSTOM's **Model 6** Switch Machine has evolved to become the Industry Standard for Yard Machines. The Model 6 has over 80 years of proven performance and is truly a trusted, versatile machine. The Model 6 Electric Switch Machine is designed for flat or gravity-type classification yards and industrial sidings. The unit has ample power for throwing switches of large rail. The machine's mechanism is constructed so that it may be trailed without damaging the machine, switch points or fittings. The Model 6 is designed for power operation only, no means other than hand cranking being provided for manual operation. The switch machines operate using 110VAC or VDC. They are available in two operating speeds. The regular speed machine has an operating time of 1.25-seconds. And the high-speed machine has an operating speed of 0.6-seconds. All machines are supplied with heaters. They are installed in the motor and contact compartments. The heaters are 12 watts each at 110 volts; parallel connected. Model 6 switch machines are available with or without transformers, which, if required for clearance track circuit equipment, may be assembled in the contact compartment.

NEW

Model 6 AC Version Available Oct. 2006
Call 1-800-717-4477

T.O.C.

Model 6
Yard Switch Machine

Transformer Group

- **One Type K1/2, 110 volt, 60 Hz, 0.010 KVA transformer for supplying energy for clearance track circuits. The primary has taps at 6 and 98 volts. There are two secondaries, each 3 volts, with a tap at 2 volts.**
- **Two Type S2, 1 volt, 60Hz, step-up transformers, one for each clearance track circuit. They have one 20 volt secondary**
- **Two adjustable resistors for regulating the voltage of indication lights.**
- **Sixteen terminal posts.**

Model 6 Yard Machine
2006 RSSI Show Special Edition

Specifications

Data	Values
Dimensions	Length = 4'11.25" x Width = 18.875" x Height = 11.75"
Weight	~700 lbs.
Stroke Length	5.5"
Electrical Requirements	110 VAC

Ordering Information

Model 6 Switch Machine, with or without Transformer

Ordering Number	Description	Speed (sec.)	Gear Ratio	Control	Price
52500-004-08	High Speed	0.6	31.8:1	Single, 3-wire	$ 17,995
52500-004-18	Standard Speed	1.25	79.5:1	Single, 3-wire	$ 17,995
A85-0706	High Speed with Transformer Group (*) With Hand Crank	0.6	31.8:1	Single, 3-wire	$ 18,995
A85-0701	Standard Speed with Transformer Group (*) With Hand Crank	1.25	79.5:1	Single, 3-wire	$ 18,995

Note: (*) Transformer Group is Ordering Number 52506-003-01

For complete information on Model 6 Switch Machines or for ordering parts for a Model 6 switch machine, see Product Manual P1383 or the ALSTOM Web Site.

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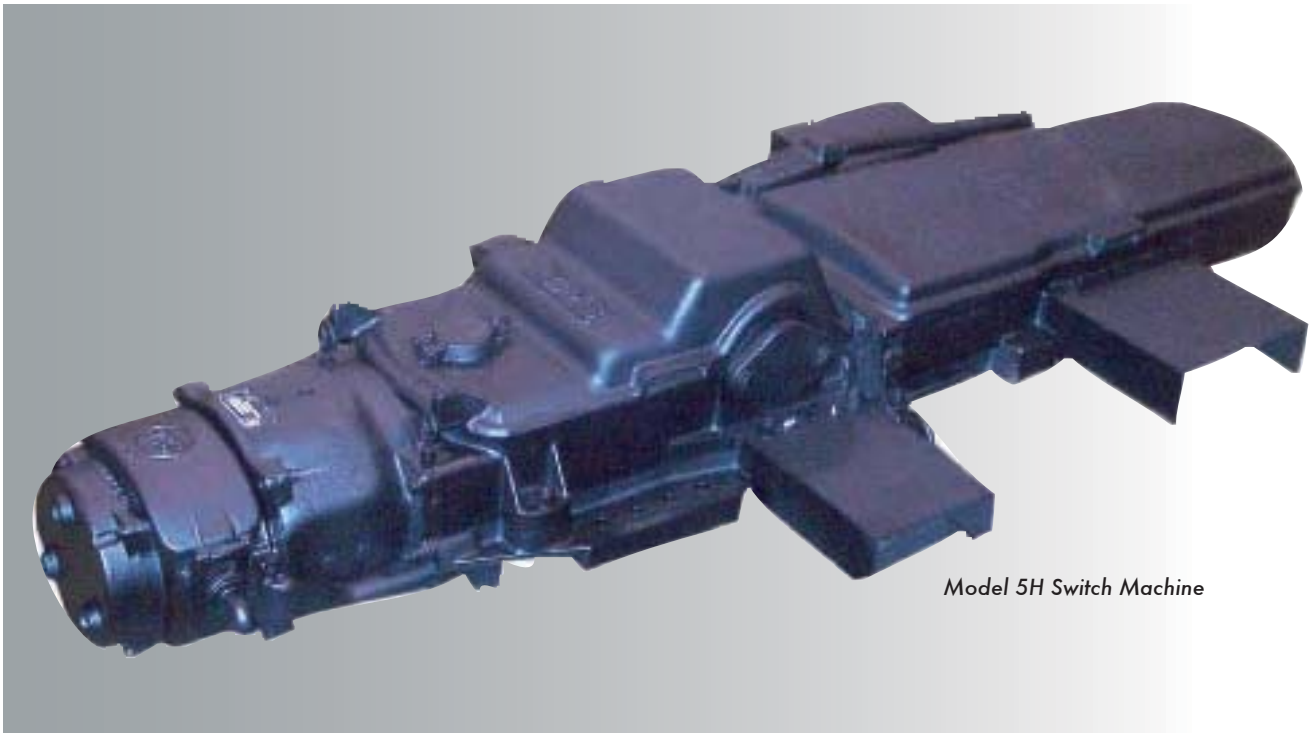
Model 5 Letter
Switch Machine Series



Model 5H Switch Machine

A Proven Value for the Long Run
ALSTOM switch machines are rugged and reliable. Their time-tested mechanical construction and field-proven circuit controller are designed to provide maximum safety and dependable operation during the machine's long service life, while requiring only minimal maintenance. They are versatile, with options for an internal controller and dual control operation (for power and hand throw. Their low profile makes them suitable for nearly any location.

Power Operation
To move the switch points, the motor drives the main gear through the intermediate gear train. As the main gear rotates from either normal or reverse position, it pushes the cam bar toward the wire entrance end of the machine, moving the dog on the cam bar out of the notch in the lock rod. This unlocks the switch points and moves the two rollers on the point detector yoke to the center of the lock dog. Thus, the point detector yoke is moved to the vertical position, opening the normal and reverse contacts and closing the motor control contacts.
Continued rotation of the main gear moves the throw bar six inches via the roller bearing. The throw bar moves the switch points which, in turn, move the lock and detector rods. When the switch points close in the opposite position, the point detector rod allows spring pressure to force the point detector yoke and attached contact block to close the opposite indication contacts. This occurs during the last stage of the cam bar movement, when the bar is withdrawn from the detector yoke rollers and simultaneously locks the lock rod in position. Dynamic snubbing brings the machine to rest without mechanical shock. At the end of the stroke, the overrun of the motor generates a dynamic current. This is sent through a low resistant circuit, which quickly slows and stops the armature rotation. The details of the snubbing circuit are different for different models of switch machines.

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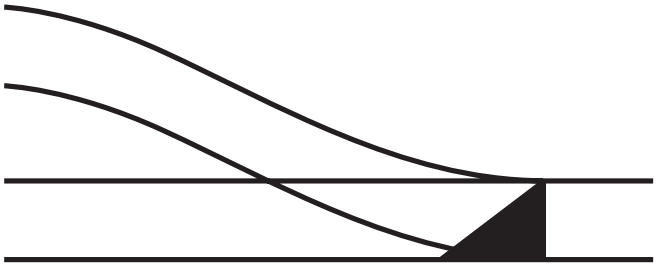
Manual Operation

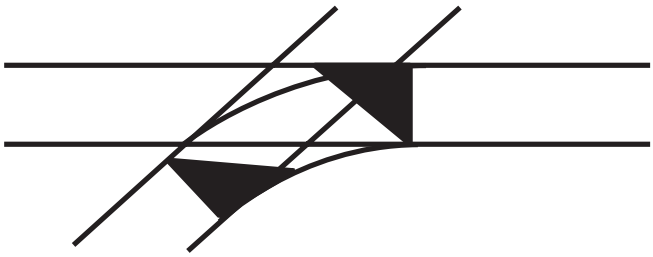
On Models 5F and 5H with the dual control feature, moving the manually operated selector lever from the POWER position to HAND position causes the selector lever contacts on the dual control mechanism to open the motor and repeater relay circuits. During hand-throw operation, the movement of the cam bar forces the rollers on the point detector yoke to be centered in the lock dog. This moves the point detector yoke to the vertical position and opens the detector contacts. The normal and reverse detector contacts do not re-close until the operator returns the selector lever to the POWER position and the machine, under power operation, locks into the called-for switch position.

Installation

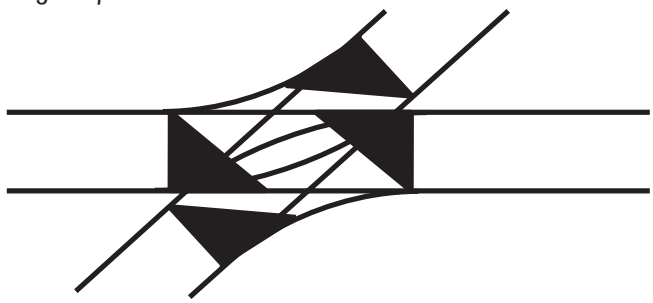
Installation and adjustment of ALSTOM switch machines is straightforward. The versatility of the machines allows them to be used in a variety of configurations, some of which can be charged in the field. The Model 5 is available in both right-hand and left-hand configurations. Other power-only machines (such as Models 5E and 5G), ordered with one lock rod and one point-detector rod, are shipped in the right-hand configuration only and can easily be altered to left-hand configuration in the field. This simply requires reversing the lock rod and point-detector rod in the machine and moving the throw bar connection to the opposite side. Models 5F and 5H (dual-control machines) are provided in both right-hand and left-hand configurations because the change-over is more complex for these models.



Single Switch

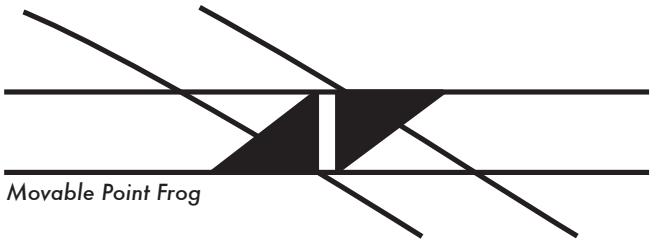


Single Slip Switch



Double Slip Switch

Single Point Derail



Movable Point Frog

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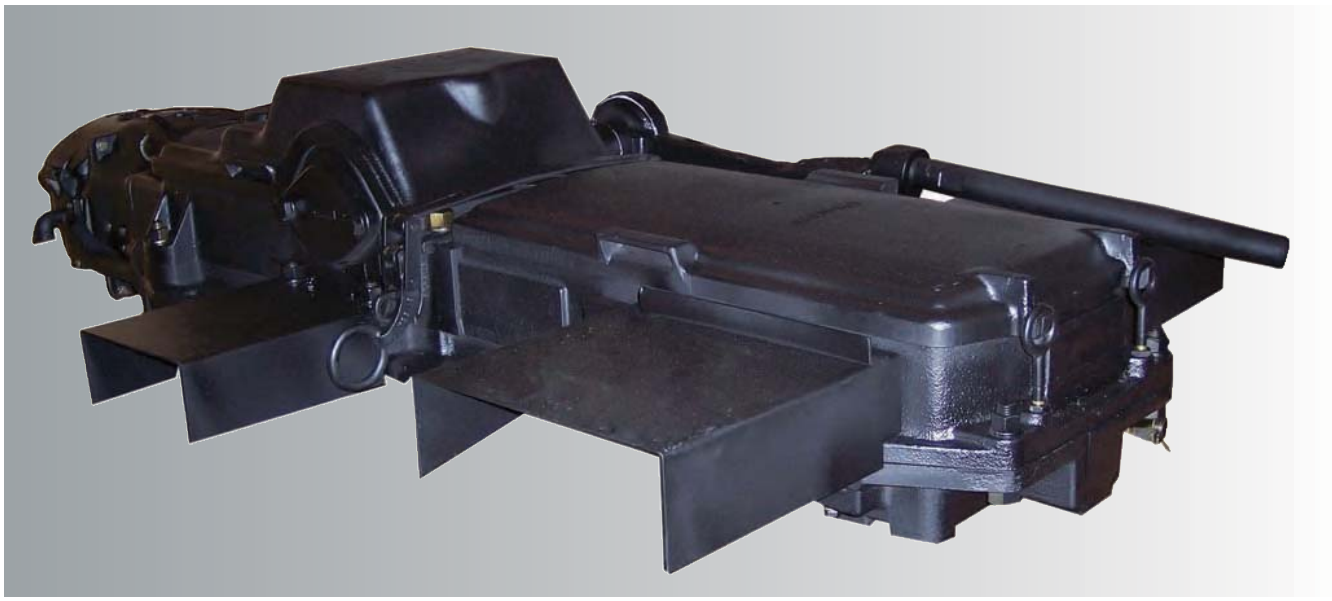
Model 5F Dual Control
Switch Machine



The **Model 5F** Electric Switch Machine is equipped with a dual control mechanism which permits either power or hand-throw operation. The Model 5F consists of an electrically operated switch and lock movement with lock rod, point-detector rod and built-in contacts that check the machine is over-and-locked in both the normal and reverse positions. The Model 5F may be hand-cranked for making and checking adjustments. The hand-crank on the Model 5F is also used for emergency switch operation in case of a power interruption. Control and overload relays for the Model 5F are housed externally. Operating time for the Model 5F is approximately 3 seconds for 110 Volt machines and 8 to 10 seconds for 24 Volt machines. The Model 5F has a permanent magnet holding device which holds the motor after the end of the stroke. The magnetic detent holds the motor armature and guards against vibration and stray electrical currents. Dynamic snubbing brings the machine to rest without shock upon the completion of the stroke. The Model 5F features internal snubbing through contacts in the point detector. The point detector has knife-edge contacts which exert extra-heavy pressure. The Model 5F has two normal, two reverse, two motor control and two shunt contacts. The machine contains an electromagnetically-operated pole changer. The motor control contacts carry and break the motor current directly. The Model 5F is frost-protected by 110 Volt heaters located in the motor, controller and contact compartments. If the installed heaters are not used, a frost shield and felt commutator cover should be installed in the motor. The Model 5F Switch Machine may be ordered in either right or left-hand configuration.

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Model 5F Dual Control
Switch Machine

Features

- **Point Detector**
  An over-and-locked type circuit controller with two normal, two reverse, two shunt and two motor-control contacts. The normal and reverse contacts check and indicate when the switch points are within the proper distance of the stock rail and are locked. The motor control contacts control the motor operating circuit.

- **Removable Hand Crank**
  Available for maintenance and emergency use. An automatic cutout contact with a latch-out feature and manual reset protects the operator.

- **Overload Friction Clutch**
  Absorbs shocks encountered in switch operation. It is factory-adjusted to slip when the motor operating current is from 12–14 ampere for 110 Volt machines and 18–20 ampere for 24 Volt machines.

- **Dual Control Mechanism**
  Permits either power or hand-throw operation.

- **Heaters**
  Provided in the motor and point detector compartments.

- **Rugged Motor**
  Provides long, reliable service. It has series, split connected, epoxy-coated, insulated field coils and an epoxy-coated armature. Dynamic snubbing limits motor overrun at the end of the stroke and a simple magnetic detent holding device then locks the motor armature. Magnetic holding is frictionless and virtually maintenance-free.

Specifications

Data	Value
Applications	Single Switch, Single-Slip Switch, Double-Slip Switch, Derail, Movable Point Frog
Mounting Requirements	Requires only two ties for mounting, meets requirements of AAR Load Curve 1457.
Thrust	Maximum rated thrust (pounds) 2,500 lbs., Maximum rated thrust (kilograms) 1,136.7 kg.
Weight	Uncrated (pounds) 980 lbs., Uncrated(kilograms) 445.5 kg.
Motor Type	DC Motor, field-wound, with permanent magnet. Magnetic detent holds motor against vibration and stray electrical currents at end of stroke
Motor Voltage	110Vdc ±20%, 24Vdc ±20%
Operating Time	110 Volt machines – 3 seconds, 24 Volt machines – 8 to 10 seconds
Clutch Setting	110 Volt machine – 12-14 Amps, 24 Volt machine – 18-20 Amps
Contacts	Provided for lock rod, point detector rod, and "over and locked" in normal and reverse positions
Dynamic Snubbing Circuit	Through contacts in the point detector. Point detector contacts: 2 normal, 2 reverse, 2 motor control and 2 shunt contacts. Motor control contacts carry and break motor current directly
Control Scheme	3-wire control, 10 or 24Vdc control voltage
Throw Bar Stroke	6"(15.2 cm)
Hand Crank	Option for maintenance and emergency use, with automatic cutout contact and latch-out feature to protect operator.
Frost Protection	110 Volt heaters in motor and contact compartments.

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Model 5F Dual Control
Switch Machine

Ordering Information
Model 5F Electric Switch Machine - Right-Hand Layouts

Lock Rod	Det. Rod	Motor	Clutch	Control	Ordering Number	Price
RH Wide-Notch Threaded End	Single Switch	24 Volt 110V Heater	24 Volt	Dual, 3wire 10 or 24VDC	54529-011-21	$ 18,995.00
RH Narrow-Notch Threaded End	Single Switch	24 Volt 110V Heater	24 Volt	Dual, 3-wire 10 or 24VDC	54529-011-25	$ 18,995.00
RH Wide-Notch Threaded End	Single Switch	24 Volt 24V Heater	24 Volt	Dual, 3wire 10 or 24VDC	54529-011-29	$ 18,995.00
RH Narrow-Notch Threaded End	Single Switch	110 Volt 24V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-10	$ 18,995.00
RH Wide-Notch Threaded End	Single Switch	110 Volt 24V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-12	$ 18,995.00
RH Wide-Notch Threaded End	Single Switch	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-16	$ 18,995.00
R/LH Nar.-Notch Spade End	Single Switch	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-20	$ 18,995.00
RH Narrow-Notch Threaded End	Single Switch	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-22	$ 18,995.00
RH Wide-Notch Threaded End	Movable Point Frog	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-29	$ 18,995.00

Ordering Information
Model 5F Electric Switch Machine - Left-Hand Layouts

Lock Rod	Det. Rod	Motor	Clutch	Control	Ordering Number	Price
LH Wide-Notch Threaded End	Single Switch	24 Volt 110V Heater	24 Volt	Dual, 3-wire 10 or 24VDC	54529-011-22	$ 18,995.00
LH Narrow-Notch Threaded End	Single Switch	24 Volt 110V Heater	24 Volt	Dual, 3-wire 10 or 24VDC	54529-011-26	$ 18,995.00
LH Wide-Notch Threaded End	Single Switch	24 Volt 24V Heater	24 Volt	Dual, 3-wire 10 or 24VDC	54529-011-30	$ 18,995.00
LH Narrow-Notch Threaded End	Single Switch	110 Volt High Speed	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-11	$ 18,995.00
LH Wide-Notch Threaded End	Single Switch	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-17	$ 18,995.00
L/RH Nar.-Notch Spade End	Single Switch	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-21	$ 18,995.00
LH Wide-Notch Threaded End	Movable Pt. Frog	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-23	$ 18,995.00
LH Narrow-Notch Threaded End	Single Switch	110 Volt High Speed	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-25	$ 18,995.00
L/RH Wide-Notch Spade End	Single Switch	110 Volt 110V Heater	110 Volt Low Speed	Dual, 3-wire 10 or 24VDC	54529-015-30	$ 18,995.00
L/RH Wide-Notch Spade End	Single Switch	110 Volt 110V Heater	110 Volt High Speed	Dual, 3-wire 10 or 24VDC	54529-015-32	$ 18,995.00

For assistance in ordering or requesting further information on the Model 5F, please contact the ALSTOM Customer Service Center 800-717-4477

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Model 5H Dual Control Switch Machine With Biased-Neutral Controller

Features

- **Point Detector**
  An over-and-locked type circuit controller with two normal, two reverse, two shunt and two motor-control contacts. The normal and reverse contacts check and indicate when the switch points are within the proper distance of the stock rail and are locked. The motor control contacts control the motor operating circuit in conjunction with the biased-neutral controller.

- **Biased-Neutral Controller**
  The machine has two biased neutral, mechanically interlocked contactors,a blocking rectifier and an overload relay. Each contactor has one dependent, front-back contact with a permanent magnet blowout (arc suppression). A snubbing contact provides dynamic motor braking at the end of the stroke. The magnetic structure prohibits armature operation until voltage of the proper polarity is applied across the coils.

- **Heaters**
  Provided in the motor, controller and point detector compartments.

- **Removable Hand Crank**
  Available for maintenance and emergency use. An automatic cut-out contact, with a latch-out feature and manual reset, protects the operator.

- **Overload Friction Clutch**
  Absorbs shocks encountered in switch operation. It is factory adjusted to slip when the motor operating current is from 12–14 Ampere for 110 Volt machines, and 18–20 Ampere for 24 Volt machines.

- **Rugged Motor**
  Provides long, reliable service. It has series, split connected, epoxy-coated, insulated field coils and an epoxy-coated armature. Dynamic snubbing limits motor overrun at the end of the stroke, and a simple magnetic detent holding device then locks the motor armature. Magnetic holding is frictionless and virtually maintenance-free.

- **Dual Control Mechanism**
  Permits either power or hand-throw operation.

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Model 5H Dual Control
Switch Machine With Biased-Neutral Controller

The Model 5H Electric Switch Machine features a dual control mechanism permitting the machine to be used in either power or hand-throw operation. The machine consists of an electrically-operated switch and lock movement with lock rod, point detector rod and built-in contacts that check if the machine is over-and-locked in both the normal and reverse positions. The Model 5H may be hand-cranked for making and checking adjustments or for emergency switch operation in case of a power interruption. The Model 5H has a built-in biased-neutral controller operated by a low-voltage DC, two-wire polarized line circuit. Operating time for the machine is approximately 3 seconds for 110 Volt machines and 8 to 10 seconds for 24 Volt machines. The controller applies either 24Vdc or 110Vdc to the motor. This control voltage may be easily adjusted in the field from 24 to 10 Volts to suit railroad requirements. The Model 5H has a permanent magnet holding device which holds the motor after the end of the stroke. The magnetic detent holds the motor armature and guards against vibration and stray electrical currents. Dynamic snubbing brings the machine to rest without shock upon the completion of the stroke. The Model 5H features internal snubbing through contacts in the biased-neutral controller. The Model 5H point detector has two normal, two reverse, two motor control and two shunt contacts. The machine contains an electromagnetically-operated pole changer. The motor control contacts carry and break the motor current directly. The Model 5H is frost-protected with 110 Volt heaters located in the motor, controller and contact compartments. If the installed heaters are not used, a frost shield and felt commutator cover should be installed in the motor. The machine is shipped in either right- or left-hand configurations.

Specifications

Data	Value
Applications	Single Switch, Single-slip Switch, Double-slip Switch, Derail, Movable Point Frog
Mounting Requirements	Requires only two ties for mounting. Meets requirements of AAR Load Curve 1457
Thrust	Maximum rated thrust 2,500 lbs. (1,136.7 kg)
Weight	Uncrated 1065 lbs. (484.1 kg)
Motor Type	Series-wound DC motor. Magnetic detent holds motor against vibration and stray electrical currents at end of stroke
Motor Voltage	110Vdc at ± 20%, 24Vdc at ± 20%
Operating Time	3 seconds for 110 Volt machines, 8-10 seconds for 24 Volt machines
Clutch Setting	12-14 Amps for 110 Volt machines, 18-20 Amps for 24 Volt machines
Contacts	Provided for lock rod, point detector rod, and over-and-locked in normal and reverse positions
Dynamic Snubbing Circuit	Through contacts in the point detector. Point detector contacts: 2 normal, 2 reverse, 2 motor control, 2 shunt contacts. Motor control contacts carry and break motor current directly
Control Scheme	4-wire control, 10 or 24Vdc control voltage
Throw Bar Stroke	6.0 Inches (15.2 cm)
Hand Crank	Option for maintenance and emergency use; with automatic cutout contact and latch-out feature to protect operator
Frost Protection	Optional 110 Volt heaters for motor, controller and contact compartments. If heaters are not used, a frost shield and felt commutator cover should be installed in motor. The point detector contacts feature a long wipe to help prevent frost buildup on the contacts

Model 5H Dual Control
Switch Machine With Biased-Neutral Controller

Ordering Information
Model 5H Electric Switch Machine - Right and Left-Hand Layouts

Lock Rod	Det. Rod	Motor	Clutch	Control	Ordering Number	Price
RH Wide-Notch Threaded End	Single Switch	24 Volt	24 Volt	Dual, 4-wire 110 or 24VDC	54505-011-33	$19,999.00
R/LH Wide-Notch Threaded End	Single Switch	110 Volt	110 Volt	Dual, 4-wire 110 or 24VDC	54505-015-20	$19,999.00
R/LH Nar.-Notch Threaded End	Single Switch	110 Volt	110 Volt	Dual, 4-wire 110 or 24VDC	54505-015-30	$19,999.00
R/LH Wide-Notch Threaded End	Single Switch	24 Volt	24 Volt	Dual, 4-wire 110 or 24VDC	54505-011-34	$19,999.00
LH Narrow-Notch Threaded End	Single Switch	24 Volt	24 Volt	Dual, 4-wire 110 or 24VDC	54505-011-42	$19,999.00
R/LH Wide-Notch Threaded End	Movable Point Frog	24 Volt	24 Volt	Dual, 4-wire 110 or 24VDC	54505-011-36	Call for price
R/LH Wide-Notch Threaded End	Single Switch	110 Volt	110 Volt	Dual, 4-wire 110 or 24VDC	54505-015-21	$19,999.00
R/LH Nar.-Notch Threaded End	Single Switch	110 Volt	110 Volt	Dual, 4-wire 110 or 24VDC	54505-015-31	$19,999.00
LH Wide-Notch Threaded End	Movable Point Frog	110 Volt	110 Volt	Dual, 4-wire 110 or 24VDC	54505-015-23	$19,999.00
LH Narrow-Notch Spade End	Single Switch	110 Volt	110 Volt	Dual, 4-wire 110 or 24VDC	54505-015-48	$19,999.00

For assistance in ordering or requesting further information on the Model 5F, please contact the ALSTOM Customer Service Center at 800-717-4477 or go the ALSTOM Web Site

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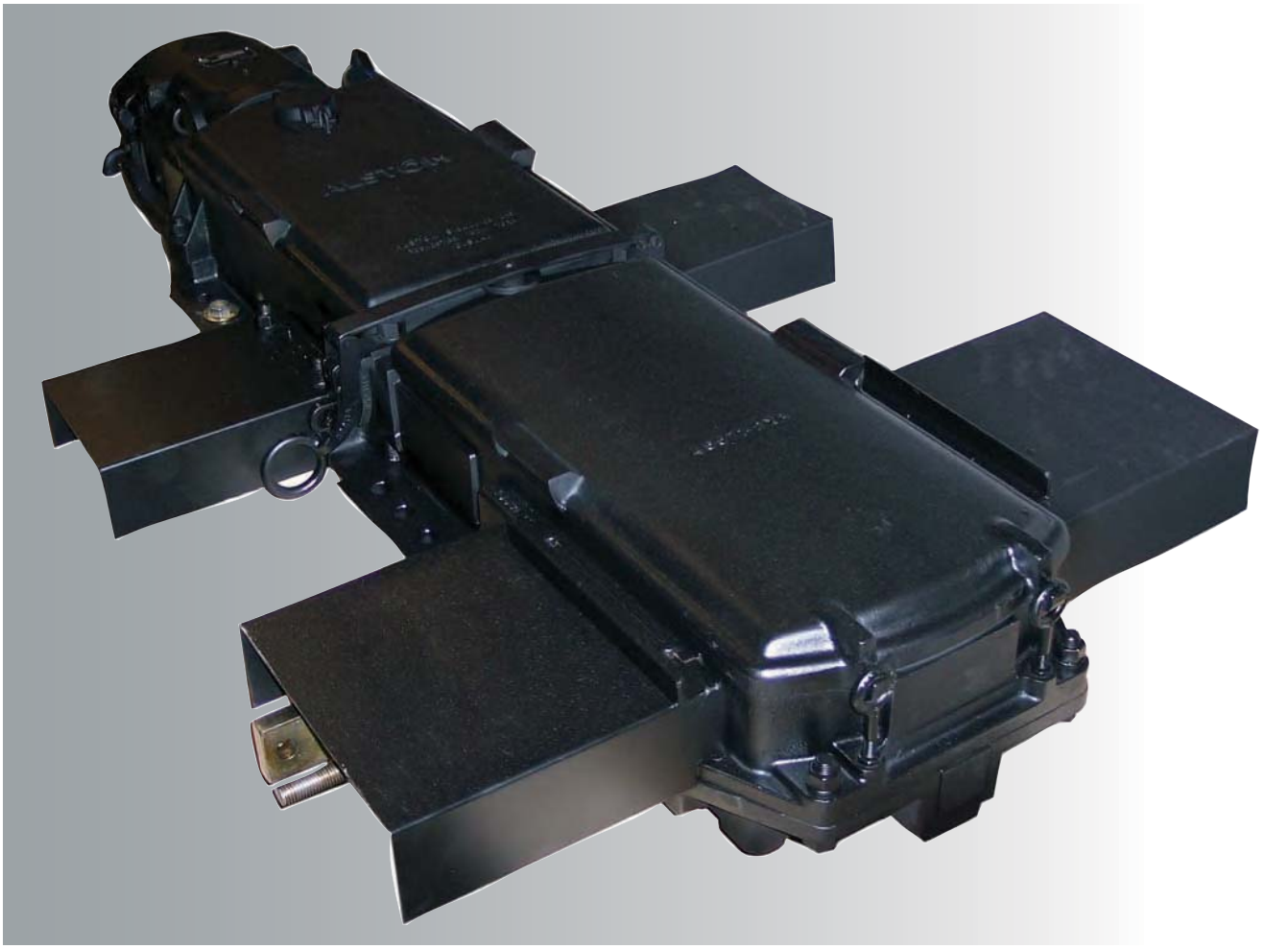
Model 5E Single Control
Switch Machine



The **Model 5E** Electric Switch Machine is the same as the Model 5F except that it is used for power operation only. The machine consists of an electrically operated switch and lock movement with lock rod, point detector rod and built-in contacts. The Model 5E may be hand-cranked for making and checking adjustments or for emergency switch operation in case of a power interruption. Control and overload relays for the Model 5E are housed externally. Operating time for the machine is approximately 3 seconds for 110 Volt machines and 8 to 10 seconds for 24 Volt machines. Dynamic snubbing helps bring the machine to rest without shock, upon the completion of a stroke. The Model 5E features internal snubbing through contacts in the point detector which has two normal, two reverse, two motor control and two shunt contacts. The point detector has knife-edge contacts which exert extra heavy pressure, and a long contact wipe that helps clear the contacts from frost or residue. The Model 5E is further frost-protected using 110 Volt heaters located in the motor and contact compartments. If the installed heaters are not used, a frost shield and felt commutator cover should be installed in the motor.

Ordering Information
Model 5E Electric Switch Machine - Right and Left-Hand Layouts

Lock Rods	Det. Rod	Motor	Clutch	Control	Ordering Number	Price
RH Wide-NotchThreaded End	Movable	110 Volt	110 Volt			
R/LH Wide-NotchThreaded End	PointFrog	High Speed	High Speed	Single, 3-wire 110 or 24VDC	54519-015-06	$ 15,995.00
LH Wide-Notch Threaded End	Movable	110 Volt	110 Volt			
LH Wide-Notch Threaded End	Point Frog	High Speed	High Speed	Single, 3-wire 110 or 24VDC	54519-015-07	$ 15,995.00

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Model 5G Single Control Switch Machine With Biased-Neutral Controller

The **Model 5G** Electric Switch Machine is similar to the Model 5H except it is designed for power operation only. The machine consists of an electrically operated switch and lock movement with lock rod, point detector rod and built-in contacts that check if the machine is over-and-locked in both the normal and reverse positions. The Model 5G may be hand-cranked for making and checking adjustments or used for emergency switch operation in case of a power interruption. The Model 5G has a built-in biased-neutral controller operated by a low-voltage DC, two-wire, polarized line circuit. Operating time for the machine is approximately 3 seconds for 110 Volt machines and 8 to 10 seconds for 24 Volt machines. The controller applies either 24Vdc or 110Vdc to the motor. This control voltage may be easily adjusted in the field from 24 to 10 Volts to suit railroad requirements. The Model 5G has a permanent magnet holding device which holds the motor after the end of the stroke. The magnetic detent holds the motor armature and guards against vibration and stray electrical currents. Dynamic snubbing helps bring the machine to rest without shock upon the completion of a stroke. The machine features internal snubbing through contacts in the biased-neutral controller. The point detector has knife-edge contacts which exert extra-heavy pressure and a long contact wipe that helps clean the contacts of frost or residue. The Model 5G controller has two normal, two reverse, two motor control, and two shunt contacts. The machine contains an electromagnetically-operated pole changer. The motor control contacts carry and break the motor current directly. The Model 5G is frost protected using 110 Volt heaters located in the motor, controller and contact compartments. If the installed heaters are not used, a frost shield and felt commutator cover should be installed in the motor.

Ordering Information

Model 5G Electric Switch Machine - Right & Left-Hand Layouts

Lock Rods	Det. Rods	Motor	Control	Ordering Number	Price
RH Wide-Notch Threaded End	Single Switch	110 Volt w/110 Volt Heater	Single	54504-015-26	$ 21,199.00
R/LH Wide-Notch Threaded End, RH Wide-Notch Threaded End	Movable Point Frog	110 Volt w/110 Volt Heater	Single	54504-015-35	$ 18,995.00
LH Narrow-Notch Spade End, R/LH Wide-Notch Spade End	Movable Point Frog	110 Volt w/110 Volt Heater	Single	54504-015-40	$ 22,900.00
R/LH Narrow-Notch Spade End	Single Switch	Volt Heater	Single	54504-015-31	$ 21,199.00
LH Narrow-Notch Spade End, R/LH Narrow-Notch Spade End	Movable Point Frog	110 Volt w/110 Volt Heater	Single	54504-015-41	$ 22,900.00
R/LH Wide-Notch Threaded End, RH Wide-Notch Threaded End	Movable Point Frog	110 Volt w/110 Volt Heater	Single	54504-015-47	$ 21,999.00

For assistance in ordering or requesting further information on the Model 5G, please contact the ALSTOM Customer Service Center 800-717-4477

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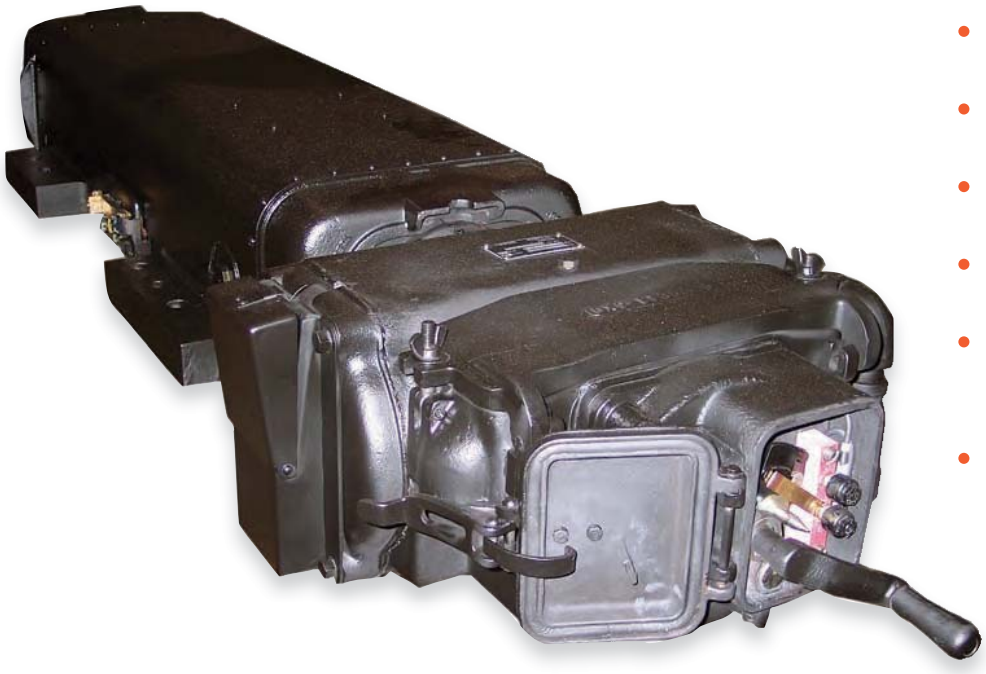
Model 5T
Switch Machines for Transit



Features

- **Maximum Safety**
- **Low 8 inch Profile**
- **Point Detector**
- **Hand Crank**
- **Dynamic Snubbing**
- **Fast Operation - 3 Second Throw Time**
- **Ideal for subway or rapid transit properties**

Lowest Profile Machine in the Industry

The **Model 5T** Electric Switch Machine is ideal for subway or rapid transit properties and incorporates all the features required to meet interlocking practices. The Model 5T Switch Machine has a compact design measuring 64" long, 8" high and 33" wide. The incredibly low 8 inch profile makes this machine particularly desirable by many Transit properties. Additionally, the machine has a throw time of 3 seconds which is one of the fastest throw times in the industry. The unit weighs approximately 600 lbs. The switch machine has a 110Vdc motor which drives the gear train, which moves the throw bar and lock rods through a full stroke in less than 3 seconds. Operating energy is derived from a central source, fed through external control relays and applied to field windings and armature of the motor. After the machine has operated to the called position and locked the switch, a dynamic snub arrangement stops the motor. A ceramic, permanent, magnetic detent restrains the motor armature after the dynamic snub stops the armature rotation at the completion of a stroke or whenever energy is removed from the motor. A hand crank is provided for maintenance or emergency purposes. Covers may be specified without guards or with guards riveted or bolted on. Guides for left- and right-hand gibs for the throw bar and wear plates for the lock rod are replaceable.

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Model 5T
Switch Machines for Transit

Specifications

Data	Value
Application	Transit
Thrust	Maximum rated thrust 500 lbs. (227 kg)
Weight	Uncrated 600 lbs. (272.7 kg.)
Dimensions	Length 64 inches (162.56 cm), Width 33 inches (83.82 cm), Height 8 inches (20.32 cm)
Motor Type	DC Motor with permanent magnet and field-wound; magnetic detent holds motor against vibration and stray electrical currents at end of stroke
Motor Voltage	110VDC
Operating Time	Under 3 seconds for 110 Volt machines
Clutch Setting	12-14 Amps for 110 Volt machines
Control Scheme	3-wire control, 10 or 24VDC control voltage
Throw Bar Stroke	6.0 inches (15.2 cm)
Hand Crank	Optional for maintenance and emergency use; with automatic cutout contact to protect operator
Frost Protection	Not available

Ordering Information
Model 5T Electric Switch Machine

Layout	Motor(VDC)	Speed(Sec.)	Description	Ordering Number	Price
Left-hand	110	Under 3	without guards	45506-011-01	$ 28,995.00
Right-hand	110	Under 3	without guards	45506-011-02	$ 28,995.00
Left-hand	110	Under 3	with guards	45506-011-03	$ 28,995.00
Right-hand	110	Under 3	with guards	45506-011-04	$ 28,995.00

For assistance in ordering or requesting further information on the Model 5T Switch Machine for Transit Applications, please contact the ALSTOM Customer Service Center 800-717-4477

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Model 9B
Electric Switch Lock

Features

- **Available in two heights – high and dwarf**
- **Door cannot be closed unless the switch is locked**
- **Banner type indicator displays LOCKED or UNLOCKED**
- **Four adjustable contacts, actuated by the operating handle**
- **Emergency release provided**
- **Door-operated circuit controller optional**
- **Sturdy, weatherproof construction**
- **Easy maintenance**

The Industry Standard, **Model 9B** Electric Switch Lock has a proven track record in the field and has a longevity in the industry second to none. The Model 9B Electric Switch Lock prevents unauthorized operation of switch stands, hand-throw switch machines, derails and other devices. The unit may be electrically interlocked with the signaling system or remotely locked by the dispatcher, preventing switch operation unless traffic conditions permit. The Model 9B Switch Lock operates by means of a plunger which is lowered into a hole in the lock rod connected to switch points, derails, or other devices. The Model 9B is available in two heights: high and dwarf. The unit's cast-iron base is bolted to the pedestal of a high lock, or in the case of a dwarf configuration, directly to the mechanisms case. The base has two compartments for the wires and locking plunger. A wire entrance plate or a junction box may be bolted to the wire compartment. A pressure grease fitting is provided for lubricating the locking plunger.

Ordering Information

Description	Ordering Number	Price
MODEL 9B LOCK, high, with door-operated circuit controller and emergency release	21150-201-20	$ 7,595.00
MODEL 9B LOCK, high, without circuit controller and emergency release	21150-201-05	$ 7,500.00
MODEL 9B LOCK, high, with door operated circuit breaker and without emergency release	21150-201-06	$ 7,595.00
MODEL 9B LOCK, high, without door operated circuit breaker and with emergency release	21150-201-18	$ 7,195.00
MODEL 9B LOCK, dwarf, with door-operated circuit controller and emergency release	21150-201-43	$ 7,595.00
MODEL 9B LOCK, dwarf, without circuit controller and with emergency release	21150-201-10	$ 7,995.00
MODEL 9B LOCK, dwarf, with door operated circuit breaker and without emergency release	21150-201-12	$ 7,995.00
JUNCTION BOX, replaces wire entrance plate. Has two terminal blocks, each with twelve No. 14-24 posts, Includes 1.50" pipe-threaded hole for wire entrance	06226-034-02	$ 1,295.00
MODEL 9B LOCK, dwarf, without door operated circuit controller and emergency release	21150-201-55	$ 7,995.00

For assistance in ordering or requesting further information on the Model 9B Electric Switch Lock, please contact the ALSTOM Customer Service Center 800-717-4477

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Model 10A
Electric Switch Lock

Features

- **No need to DAP the ties**
- **Indication lamp protected by shock-absorbing mounting**
- **Large, sturdy, silver-to-silver contacts**
- **Vital parts held under constant tension to minimize vibration wear**
- **Convenient pedal built to withstand rough operation**
- **Self-lubricated bearings**
- **Observation window protects indication lamp**

The **Model 10A** Electric Switch Lock is used to securely lock the hand-throw lever of a hand-operated switch machine or ground-throw switch stand in the normal position. It provides a means of interlocking a manually-operated switch with the signal circuits so that the switch may not be operated unless traffic conditions permit, or unless the normally-sealed emergency release is operated. This switch lock does not require dapping the ties and may be applied to either a right- or left-hand layout. The cast-construction of the Model 10A Switch Lock makes it very durable. It is designed for 8 to 12VDC operation. If AC operation is required, a transformer and rectifier are required in a separate housing. The contact arrangements available with the Model 10A Switch Lock are shown with the switch lock in the normal position (fronts open, backs closed). Contacts 1 and 5 are actuated by the energization of the lock-magnet coils. Contacts 2, 3, and 4 are actuated whenever the padlock is removed.

Specifications

Data	Value
Dimensions	Width = 9" (22.86 cm) Height = 11½" (29.21 cm) Depth = 15-7/16" (39.21 cm)

For assistance in ordering or requesting further information on the Model 10A Electric Switch Lock, please contact the ALSTOM Customer Service Center 1-800-717-4477

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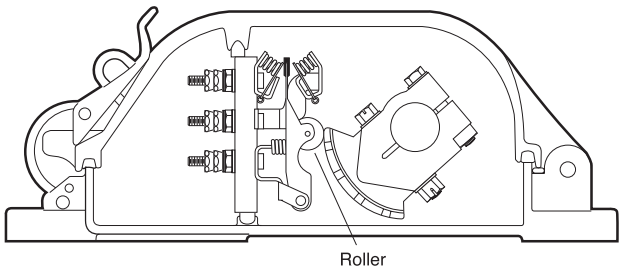
Models 7J and 7K
Switch Circuit Controllers

Applications

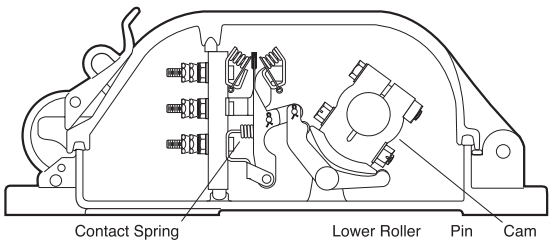
- **Switch Point Position (normal or reverse)**
- **Switch Point Locking**
- **Bridge Locking and Bridge Position**
- **Rail-Joint Sealing**
- **Tunnel Door Position**

Industry Standard

The **Model 7** line of switch circuit controllers meets the rigorous demands of the rail industry – high sensitivity, reliability, and rugged strength to withstand great mechanical stress under a wide range of environmental conditions. The controller may be used to integrate the positions of various devices with suitable control circuits. Commonly used with switch machines to detect switch positions, Model 7 controllers can also detect the positions of derails, bridge locks, slide detectors, etc. They can shunt track circuits as well as control relay circuits. The arched cast-iron case provides great mechanical strength, eliminates projecting corners, and offers full access to all internal parts.



Model 7J Switch Circuit



Model 7K Switch Circuit Controller

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Models 7J and 7K
Switch Circuit Controllers

Features

- **Rugged**
  Heavily reinforced case, 1.5 inch cold-drawn steel shaft, corrosion and wear resistant cams, spring steel cam surfaces
- **Sensitive**
  A 5-degree movement of the crank transfers the contacts (vibration doesn't affect contacts)
- **Reliable**
  Positive action contact mechanism, spring contact pressure, withstands vibration
- **Easy Internal Access**
- **Ventilators Minimize Condensation**
- **Versatile**
  Cams adjustable to operate contacts simultaneously or progressively, left or right-hand operation, wide choice of fittings and accessories
- **Large Camshaft**
  Camshaft 1.5" (3.81 cm) in diameter
- **Field Adjustable**
  Cams may be adjusted to operate the contacts at any desired position of the actuating device
- **Terminal Compartment Sealed Off From Grease and Oil Contamination**

Ordering Information

Description	Ordering Number	Price
7J CONTROLLER COMPLETE	53530-030-01	$ 1,699.00
7K CONTROLLER COMPLETE	53530-031-01	$ 1,995.00
CAP, for wire outlet, with 1.50" (3.81 cm) std. pipe tapped hole	35491-004-00	$ 49.00
CAP, for wire outlet, with 1.25" (3.18 cm) std. pipe tapped hole	35491-024-00	$ 150.00
COUPLING, 45 degree, for 1.50" (3.81 cm) flexible conduit	45688-092-02	$ 159.00
CRANK, with insulated ball pin, 1.0" (2.54 cm) offset, 5.375" (13.65 cm) centers	38660-015-01	$ 179.00
CRANK, with insulated ball pin, 1.0" (2.54 cm) offset, 4.50" (11.43 cm) centers	38660-020-02	$ 300.00
CAP, two required, for terminating shunt wires, for two 0.243" (6.172) mm dia. cables	56607-001-03	$ 459.00
CENTERING ATTACHMENT, for broken switch rod protection, includes gasket	53231-002-01	$ 350.00

For assistance in ordering or requesting further information on the 7J or 7K Switch Circuit Controllers, please contact the ALSTOM Customer Service Center 800-717-4477

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Additional Switch Products

Junction Terminal Box

Call the ALSTOM Customer Service Center for assistance in selecting any additional switch products including layouts, layout parts. ALSTOM has prided itself on providing complete switch machine layouts and parts for layouts for many years. We will provide you with the required material, and be happy to assist you in determining what is needed. Call us at 800-717-4477 or check our reference material online at www.alstomsignalingsolutions.com.

Ordering Information

Description	Ordering Number	Price
Junction Terminal Box Complete, with pedestal, has 36 terminal posts, hole for 2" conduit	A91-0230	$ 899.00
Junction Terminal Box Only, has 36 terminal posts, hole for 2" conduit	52918-009-01	$ 715.00
Cover Complete	45520-013-01	$ 149.00
Adapter, for 3.50" dia. pipe	57452-000-01	$ 160.00
Pedestal, 3.50" pipe, with base	18006-001-00	$ 229.00
Terminal Block, 2 terminals with connector	46048-022-04	$ 99.00
Terminal Block, 3 terminals with connector	05971-044-00	$ 67.00
Terminal Block, 2-way (1c - 1d)	P62-0339	$ 169.00
Terminal Block, 12-way	A03-0129	$ 73.00
Terminal Block, 6-way, may be separated into 3-way blocks	A03-0127	$ 64.00
Terminal Block, 6-way, may be separated into 3-way blocks	A03-0130	$ 152.00
Hook Bolt, for cover	35446-007-00	$ 40.00

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Train Stop Mechanism

Features

- **Totally automatic and independent from the motorman**
- **Stops train if attempting to pass a restrictive signal**
- **Rugged cast iron construction**
- **Key-by contactor available (option) for use by motorman**

The **Train Stop** is used to automatically stop a train if there is a failure to comply with a restrictive signal indication. The Train Stop mechanism is used in conjunction with wayside signals to ensure observance of, and compliance with, restrictive indications. The Train Stop operation is totally automatic and entirely independent of any action taken by the motorman. The Train Stop mechanism function uses a mechanical contact between a wayside trip arm and a trip cock arm on the train. The wayside trip arm is lowered when the signal is clear, and raised when the signal is at stop. In the raised position, the trip arm engages the trip cock arm on any train attempting to pass the signal, causing the train to stop. When the signal clears, the arm is lowered, allowing the train to continue on. The Train Stop mechanism is housed in a rugged cast iron case and weighs approximately 250 pounds. It consists of a motor and gear housing, circuit controller with driving arm, compression return spring and sector gear. It operates using 110V, 60Hz energy. A heater may be furnished for operation in extremely cold regions. A key-by contactor is available which permits the motorman to lower the trip arm to allow the train to pass. The contactor is typically mounted on a wayside signal pole, and is accessible without the motorman having to leave the cab.

Specifications

Data	Value
Height	9.875"(25.08 cm)
Width	21.8125"(55.40 cm)
Length	26.375"(66.99 cm)
Weight	Approx. 250 lbs. (113.5 kg)

Ordering Information

Description	Ordering Number	Price
TRAIN STOP COMPLETE	50100-023-00	$ 8,295.00
TRAIN STOP COMPLETE, with heater	50100-024-00	$ 8,295.00
KEY-BY CONTACTOR COMPLETE	04987-004-01	$ 1,995.00

For assistance in ordering a Train Stop, please contact the ALSTOM Customer Service Center at 800-717-4477

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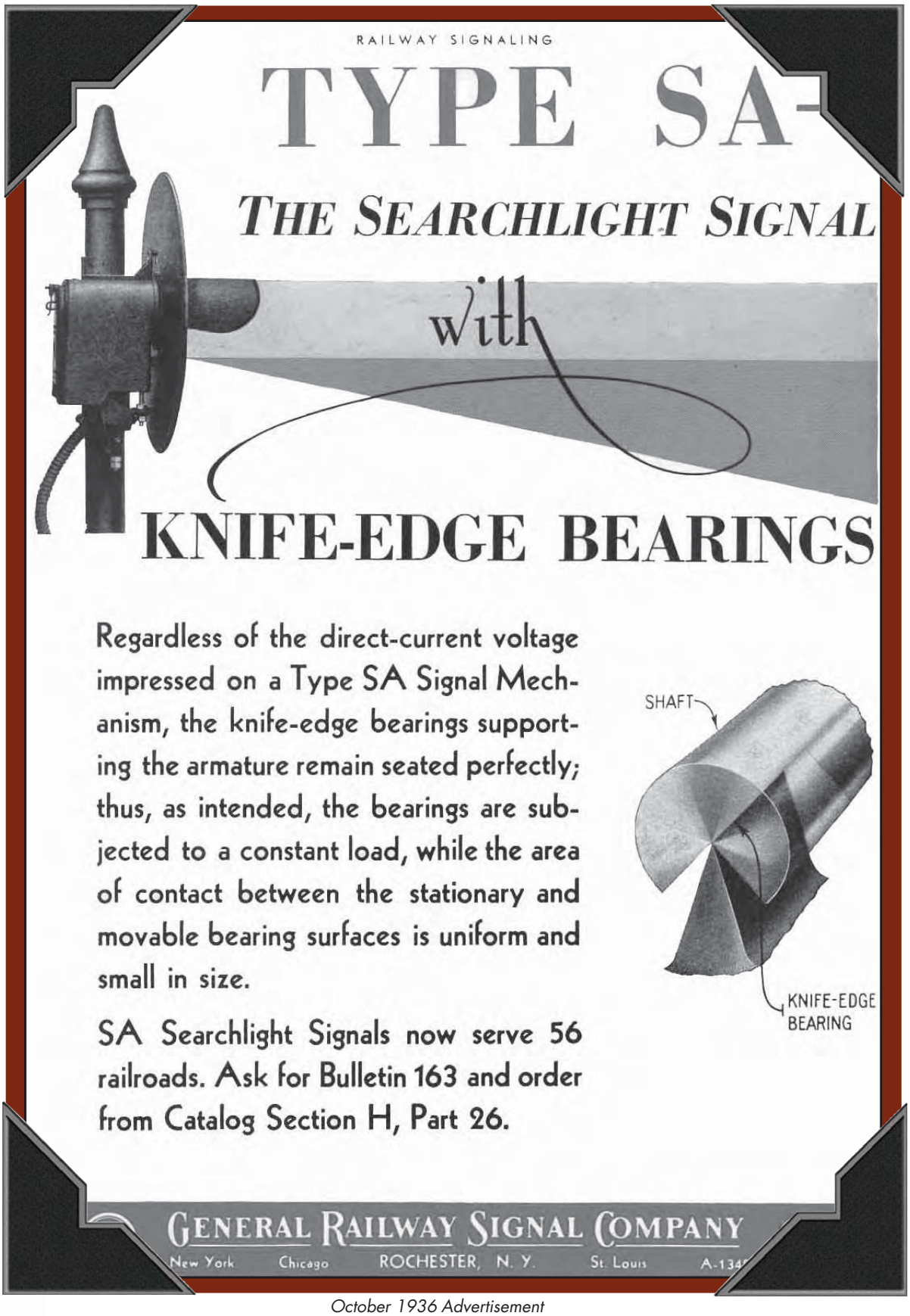
Looking Back


RAILWAY SIGNALING
TYPE SA-
THE SEARCHLIGHT SIGNAL
with
KNIFE-EDGE BEARINGS
Regardless of the direct-current voltage impressed on a Type SA Signal Mechanism, the knife-edge bearings supporting the armature remain seated perfectly; thus, as intended, the bearings are subjected to a constant load, while the area of contact between the stationary and movable bearing surfaces is uniform and small in size.
SHAFT
KNIFE-EDGE BEARING
SA Searchlight Signals now serve 56 railroads. Ask for Bulletin 163 and order from Catalog Section H, Part 26.
GENERAL RAILWAY SIGNAL COMPANY
New York Chicago ROCHESTER, N. Y. St. Louis

October 1936 Advertisement

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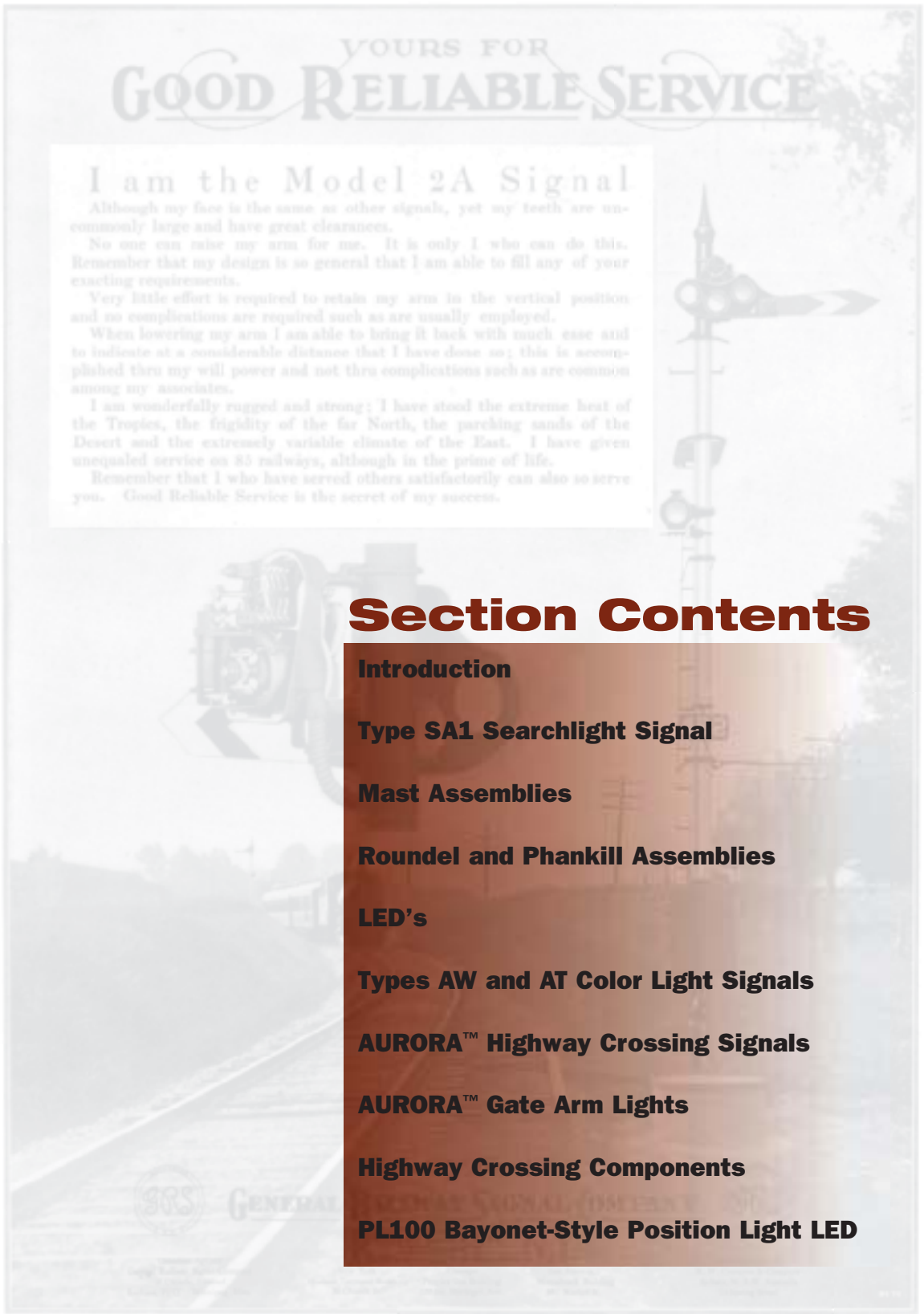

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Roundel and Phankill Assemblies

LED's

Types AW and AT Color Light Signals

AURORA™ Highway Crossing Signals

AURORA™ Gate Arm Lights

Highway Crossing Components

PL100 Bayonet-Style Position Light LED

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Introduction

With more than 100 years of experience in signaling, ALSTOM provides signal solutions for mainline railroad and rapid transit wayside signals, interlockings, classification yards, and highway crossings. For the past century, ALSTOM has continually improved the safety and design of their signals.

The SA-1 Searchlight signals have proven to be the standard for reliability, flexibility, and fail-safe design. They are available in a high wayside signal or a 1 or 2 unit dwarf with a choice of either a compound or stepped lens system.

The AW and AT Color-Light signals are designed for use in transit installations and are available with incandescent or LED lights. The latest enhanced design reduces spare parts requirements, simplifies access for maintenance, lowers cost of ownership, and increases safety.

The AURORA™ line of LED signals includes highway crossing flashing light units (8" and 12") as well as crossing gate arm flashing lights. The flashing light LED retrofit kits will replace old incandescent lights in just about any highway crossing installation. The AURORA gate arm kits come in a Quick Install version that takes just ten minutes to install.

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Type SA-1
Searchlight Signal

Features

- Aspect-checking contacts directly operated by counterweights
- Slanted color discs minimize beam dilution
- Choice of compound or stepped lens system
- Available with 20-degree deflecting roundel or 30-degree Spredlite roundel
- Wide choice of assemblies and wire entrance couplings
- Precision filament lamp needs no refocusing when changing
- Built-in sighting fixture
- Built-in surge arrestor
- Plug-in, cartridge-type, adjustable lamp resistor
- Optional phankill unit reduces beam dilution

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Type SA-1
Searchlight Signal

The Type SA-1 Searchlight Signal features an efficient electromagnetic structure, maximum back contact pressure, positive contact closure and precise color-disc positioning. This signal operates from battery or rectified AC-energy (8-12VDC).

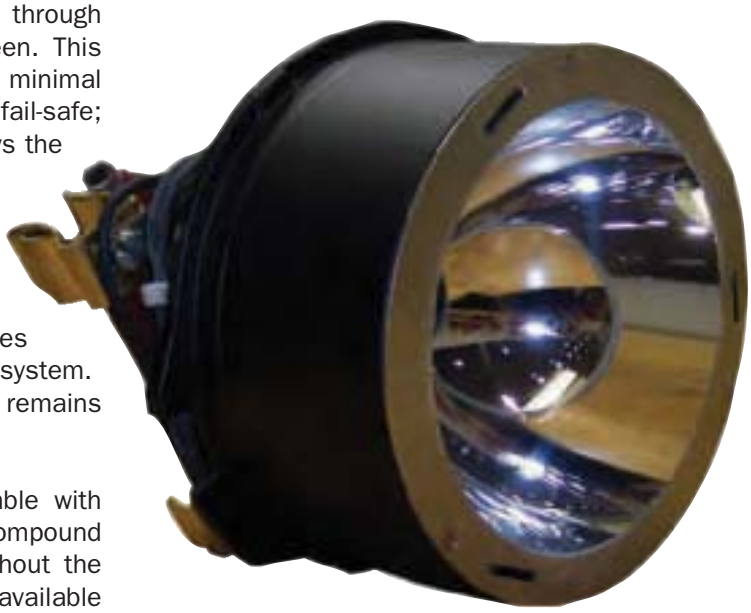
The Type SA-1 Signal consists of a compact operating mechanism and a durable cast aluminum housing. The housing may be bracket mounted to the side or front of the signal mast, provided with a socket for mounting to the top of the mast or provided with a base mounting for a concrete foundation.

The Type SA-1 Signal projects three aspects through a single optical system: red, yellow and green. This system supplies a powerful light beam using minimal energy. The signal has been designed to be fail-safe; if power is interrupted, it automatically displays the most restrictive aspect.

The signal housing includes an 8.375" (21.3 cm) diameter lens, hood, ventilators, background, mounting bracket, base, or mounting socket. The unit's operating mechanism slides easily into place using a hanger and track system. Cams and locking pins ensure the mechanism remains in a secure, locked position.

All Type SA-1 Searchlight Signals are available with either a compound or stepped lens. The compound lens produces a longer-range light beam without the need for additional power. Outer roundels are available to spread or deflect the light beam for installations where the track curves. A phankill can also be supplied to minimize light beam dilution and prevent phantom signals caused by sunlight. Type SA-1 Mast-Mounted High Signals consist of two major assemblies: signal heads complete with either an operative or inoperative mechanism, and mast assemblies complete with pinnacle, base, ladder, ladder foundation and platform.

Type SA-1 Dwarf Signals use one or two mechanisms. Optional equipment includes roundel and phankill assemblies, wire entrance couplings, conduit and adjustable lamp resistors.



Specifications

Value	Data
Overall length of signal, including hood	Compound lens system: 34"(86.36cm) Stepped lens system: 29-3/4"(75.57 cm)
Overall height of signal (either lens system)	27-7/8"(70.80 cm)
Lens bezel ring, overall diameter:	10" (25.40 cm)
Weight of Signal housing and signal mechanism	Stepped lens system: 140 lbs. (63.56 kg) Compound lens system: 160 lbs. (72.74 kg) Signal mechanism only: 25 lbs. (11.35 kg)

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Type SA-1
Searchlight Signal

Durable Cast Aluminum Housing

Ordering Information
Type SA-1 Signal, High Signal Heads, with Mechanism

Type of Mechanism	Lens System	Aspect Color	Type of Wire Connection	Ordering Number	Price
Operating	Compound	GRY	Plug Coupler	A76-0114	$ 10,995.00
Inoperative	Compound	R	AAR Terminals	A76-0115	$ 6,995.00
Operating	Stepped	GRY	Plug Coupler	A76-0118	$ 10,995.00
Inoperative	Stepped	R	AAR Terminals	A76-0119	Call for price

Note 1: Type SA-1 Signals listed include signal housing with operating mechanism, hood, 35" diameter background, 8.375" diameter outer lens for tangent track, ventilators, and bracket for side-mounting on a 5" diameter mast.
Note 2: The following are NOT INCLUDED, please order separately: wire entrance coupling, lamp resistor, roundel, phankill assembly, top or front mounting bracket, optional 20" diameter background.

Ordering Information
Type SA-1 Signal, High Signal Heads, without Mechanism

Type of Mechanism	Lens System	Aspect Color	Type of Wire Connection	Ordering Number	Price
(None)	Compound	(None)	(None)	A76-0136	$ 2,295.00
(None)	Stepped	(None)	(None)	A76-0138	$ 1,899.00

Note 1: A signal housing, less mechanism, includes a hood,35" diameter background, 8.375" diameter outer lens for tangent track, ventilators, and brackets for side-mounting on a 5" diameter mast.
Note 2: A signal housing DOES NOT INCLUDE a wire entrance coupling. Please order separately.

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Type SA-1 Searchlight Signal
Parts and Accessories

Ordering Information
Wire Entrance Couplings for High Signal Housings

Coupling Angle	Description	Ordering Number	Price
45°	COUPLING, for 1.50" flexible conduit	A76-0526	$ 260.00
45°	COUPLING, for 0.0625" to 0.75" dia. cable	A76-0527	$ 49.00
45°	COUPLING, for 0.75" to 0.875" dia. cable	A76-0528	$ 49.00
45°	COUPLING, for 0.875" to 1.0" dia. cable	A76-0536	Call for price
45°	COUPLING, for 1.0" to 1.1875" dia. cable	A76-0537	Call for price
45°	COUPLING, for 1.1875" to 1.375" dia. cable	A76-0538	$ 259.00
45°	COUPLING, for 1.375" to 1.625" dia. cable	A76-0539	$ 149.00
45°	COUPLING, for 1.625 to 1.875" dia. cable	A76-0542	Call for price
–	COUPLING, complete with "U" bolt, reducer and gasket for 1.50" flexible conduit	A76-0568	$ 176.00
–	COUPLING, complete with "U" bolt, reducer and gasket for 0.625" to 0.75" dia. cable	A76-0529	$ 189.00
–	COUPLING, complete with "U" bolt, reducer and gasket for 0.75" to 0.875" dia. cable	A76-0530	$ 149.00
–	COUPLING, complete with "U" bolt, reducer and gasket for 0.875" to 1.0" dia. cable	A76-0531	Call for price
–	COUPLING, complete with "U" bolt, reducer and gasket for 1.0" to 1.1875" dia. cable	A76-0532	$ 158.00
–	COUPLING, complete with "U" bolt, reducer and gasket for 1.1875" to 1.375" dia. cable	A76-0533	$ 210.00
–	COUPLING, complete with "U" bolt, reducer and gasket for 1.375" to 1.625" dia. cable	A76-0534	$ 229.00
–	COUPLING, complete with "U" bolt, reducer and		

Ordering Information - Accessories

Description	Ordering Number	Price
COUPLING, for 5" (12.7 cm) mast	45689-191-00	$ 113.00
GASKET, for coupling (Ref. 1)	13014-158-00	$ 5.00
COUPLING, has one, 1" (2.54 cm) pipe-tapped hole	59202-016-00	$ 91.00
COUPLING, has one, 1.25" (3.175 cm) pipe-tapped hole	59202-017-00	$ 118.00
COUPLING, has one, 1.50" (3.81 cm) pipe-tapped hole	59202-018-00	$ 199.00
COUPLING, has two, 1.50" (3.81 cm) pipe-tapped holes, for two-unit Dwarf Signals only	59202-019-00	$ 429.00
COUPLING, 45°, for 1.50" (3.81 cm) flexible conduit	P76-0364	$ 75.00
CONNECTOR, "Liquid Tight", for 1.50" (3.81 cm) conduit	56353-058-00	$ 27.00
MOUNTING BRACKET, for front of mast	53093-012-00	$ 448.00
MOUNTING BRACKET, for top of 5" (12.7 cm) mast	54732-000-02	$ 599.00
PINNACLE, for 5" (12.7 cm) diameter mast	56894-000-08	$ 162.00
BASE, for dwarf signals	53070-005-00	$ 282.00
HOOD, 15" (38.1 cm) long, aluminum	49127-064-00	$ 65.00
BACKGROUND, 35" (88.9 cm) diameter, aluminum	49162-025-00	$ 217.00
BACKGROUND, 20" (50.8 cm) diameter, aluminum	49162-080-00	$ 159.00
(*)ADJUSTABLE LAMP RESISTOR, 1 Ω, 2.5 Amps max.	55945-010-01	$ 369.00
(*)ADJUSTABLE LAMP RESISTOR, 2 Ω, 1.75 Amps max.	55945-010-02	$ 459.00
(*)ADJUSTABLE LAMP RESISTOR, 5 Ω, 1.0 Amp max.	55945-010-03	$ 329.00

Note (*): An adjustable resistor is required for each Type SA-1 operating or inoperative signal mechanism matched to the lamp used.

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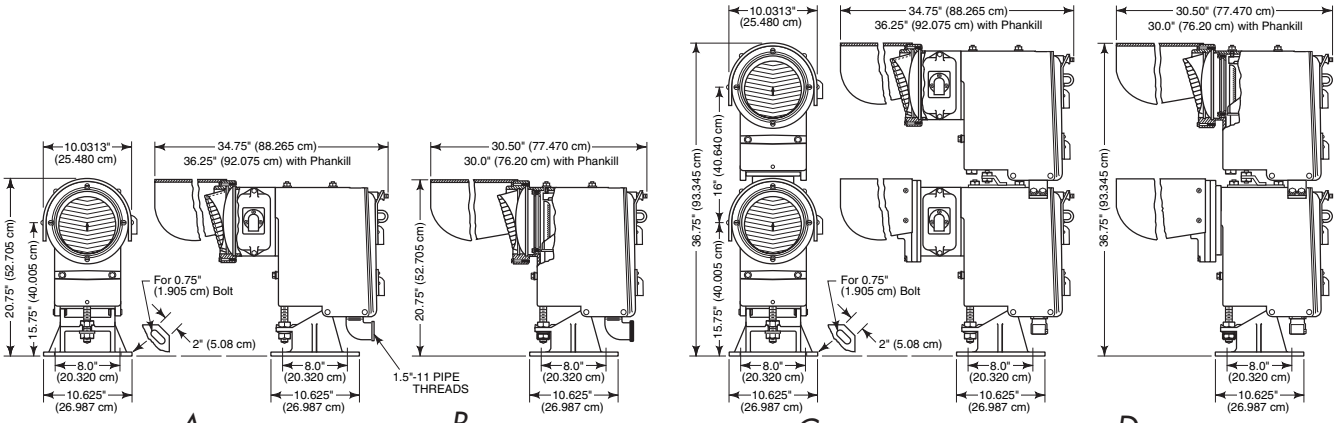
Type SA-1 Searchlight Signal
Parts and Accessories



A
Type SA-1 Dwarf with compound lens

B
Type SA-1 Dwarf with stepped lens

C
Two Unit Type SA-1 Dwarf with compound lens

D
Two Unit Type SA-1 Dwarf with stepped lens

Ordering Information - Type SA-1 Signal, Dwarf Signal Heads with Mechanism

Reference	Units	Type of Mechanism	Lens System	Aspect Color	Type of Wire Connection	Ordering Number	Price
A	1	Operating	Compound	GRY	Plug Coupler	A76-0201	$ 9,995.00
A1	1	Inoperative	Compound	R	AAR Terminals	A76-0202	$ 5,595.00
B	1	Operating	Stepped	GRY	Plug Coupler	A76-0206	$ 9,995.00
B1	1	Inoperative	Stepped	R	AAR Terminals	A76-0207	Call for price
C	2	Operating	Compound	GRY	Plug Coupler	A76-0211	$ 22,395.00
C1	2	Inoperative	Compound	R	AAR Terminals	A76-0212	Call for price
D	2	Operating	Stepped	GRY	Plug Coupler	A76-0216	$19,995.00
D1	2	Inoperative	Stepped	R	AAR Terminals	A76-0217	Call for price

Note : The dwarf signal includes the housing with operating or inoperative mechanism, hood, background, 8.375" diameter V-inclined 10° upward deflecting roundel, ventilators, and base.
Note: The dwarf signal does NOT INCLUDE wire entrance coupling, lamp resistor, or pankill assembly. Please order separately.

Ordering Information - Type SA-1 Signal, Dwarf Signal Heads without Mechanism

Type of Mechanism	Lens System	Aspect Color	Number of Units	Ordering Number	Price
–	Compound	–	1	A76-0220	Call for price
–	Stepped	–	1	A76-0221	Call for price
–	Compound	–	2	A76-0225	Call for price
–	Stepped	–	2	A76-0226	Call for price

Note : The dwarf signal includes the hood.

For assistance in ordering or requesting information, please contact the ALSTOM Customer Service Center at 800-717-4477

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Type SA-1 Searchlight Signal
Parts and Accessories

Ordering Information
Wire Entrance Couplings for Dwarf Signal Housings

Coupling Angle	Description	Ordering Number	Price
90°	COUPLING, for 1.50" flexible conduit	A76-0553	$ 274.00
Straight	COUPLING, for 1.50" dia. conduit	A76-0564	Call for price
Straight	COUPLING, for 0.75" to 0.875" dia. cable	A76-0556	Call for price
Straight	COUPLING, for 0.875" to 1.0" dia. cable	A76-0557	$ 156.00
Straight	COUPLING, for 1.0" to 1.1875" dia. cable	A76-0558	Call for price
Straight	COUPLING, for 1.1875" to 1.375" dia. cable	A76-0559	$ 249.00
Straight	COUPLING, for 1.375" to 1.625" dia. cable	A76-0562	Call for price
Straight	COUPLING, for 1.625 to 1.875" dia. cable	A76-0563	Call for price
Straight	COUPLING, for 1.1875" to 1.375" dia. cable, for two-unit dwarf signal only	A76-0567	$ 418.00

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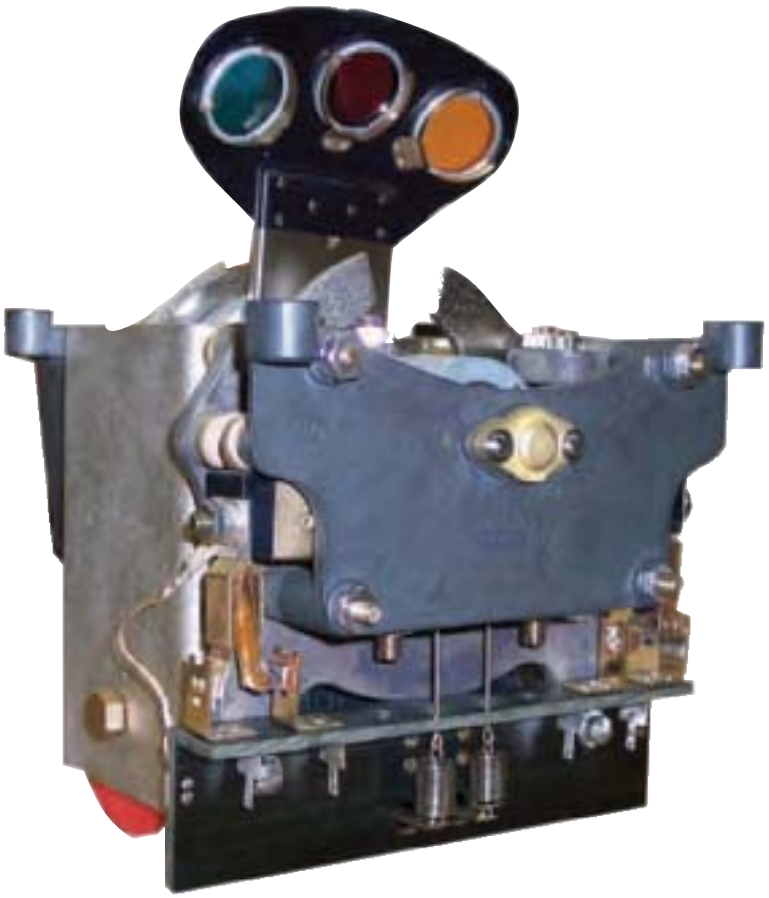
Type SA-1 Searchlight Signal
Operating and Inoperative Mechanism

The **operating mechanism** may be supplied with acompound or stepped lens system. These mechanisms come with a plug coupler for wire connections. The operating mechanism does NOT INCLUDE a lamp or the lamp resistor.

The **inoperative mechanism** is available with a compound or stepped lens system. This mechanism is supplied with standard AAR terminal posts for wire connections. The inoperative mechanism does NOT INCLUDE a lamp or the lamp resistor.



Ordering Information - Operating Mechanism

Lens System	Aspect Color	Ordering Number	Price
Compound	G R Y	59545-150-03	$ 8,229.00
Stepped	G R Y	59545-100-02	$ 8,195.00

Ordering Information - Inoperative Mechanism

Lens System	Aspect Color	Ordering Number	Price
Compound	Red	53052-339-05	$ 3,599.00
Stepped	Red	53052-387-01	$ 3,599.00

For assistance in ordering or requesting information on the Type SA-1 Searchlight Signal, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

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Mast Assemblies

Mast assemblies are available in any height required and can come complete with ladders, ladder foundation, platforms, pinnacle, and junction box or split base. They can be drilled for one, two or three signal heads. Please contact ALSTOM with your specific requirements.

Ordering Information - Mast Assemblies

Drilled For Signal Heads	Base Type	Ordering Number	Price
2	Split	73001-124-01	Call for price
2	Split Junction Box	73001-125-01	Call for price
2	Split	73001-126-01	Call for price
2	Split Junction Box	73001-024-01	$ 3,400.00
3	Split	73001-128-01	Call for price
3	Split Junction Box	73001-129-01	Call for price

Ordering Information - Foundation

Description	Ordering Number	Price
SPLIT BASE COMPLETE, for 5" mast	43951-017-01	$ 1,199.00
JUNCTION BOX BASE COMPLETE, with 24 terminal posts, for 5" mast	43951-016-06	$ 2,695.00
FOUNDATION, for ladder, includes bolts and nuts	36773-000-01	Call for price
PINNACLE, for 5" diameter mast	56894-000-08	$ 162.00

For assistance in ordering or requesting information on Mast Assemblies, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

Roundel and Phankill Assemblies

Signal heads furnished with 8.375" (21.27 cm) diameter lenses for tangent track only may be easily adapted for special conditions by adding a roundel or phankill assembly. The phankill eliminates spread. This special optical equipment comes ready-to-install except for sealing compound which must be ordered separately. ALSTOM recommends soft mastic sealing compound per ALSTOM specification 90B0010, available in a one pound plug of material.

Roundel assemblies fit both stepped and compound lens signals. Phankill assemblies for high signals have a built-in 25° close-up roundel. On compound lens high signals, remove the existing close-up roundel before installing the phankill. A phankill used with a stepped lens requires a separate order for a signal head with clear center lens, which is specially arranged for use with a phankill.

Ordering Information

Description	Ordering Number	Price
ROUNDEL ASSEMBLY, inclined 20-degree deflecting, for compound or stepped lens high signals	A76-0350	$ 936.00
ROUNDEL ASSEMBLY, 30-degree Spredlite, for compound or stepped lens high signals	A76-0353	$ 1,564.00
PHANKILL ASSEMBLY, for compound or stepped lens high signal. The inclined roundel is 30-degree Spredlite type	A76-0363	$ 1,495.00
PHANKILL ASSEMBLY, for compound or stepped lens dwarf signal	A76-0370	$ 729.00
PHANKILL UNIT, with 25-degree close-up prism, for high signals	56629-007-00	$ 787.00
PHANKILL COMP., for dwarf signals	56629-006-01	$ 313.00

For assistance in ordering or requesting information, please contact the ALSTOM Customer Service Center at 800-717-4477

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LED Retrofit Lamp Unit

5½" 90 LEDs

Features

- **Available in Red, Yellow, Green or Lunar White**
- **Adjustable Brightness – Adjusting Screw**
- **Available With 60, 90 or 120 LED's**
- **Available in Wide Beam (30 Deg.LED's), Narrow Beam (15 Deg. LED's) Or Concentric (8 Deg. LED's)**
- **With Back Light or No Back Light**
- **Fits AW Signals**

Ordering Number Configurator

	T					—				—	0	0

T	TRANSIT
R	RED
Y	YELLOW
G	GREEN
W	LUNAR WHITE
60	60 LED
90	90 LED
12	120 LED
W	Wide 30 Degree LED
N	Narrow 15 Deg. LED
C	Concentric 8 Deg.LED
H	High (110 Volt)
L	Low (10 Volt)
A	Adjustable Brightness
X	Non-adjustable Brightness
B	Back Light
X	No Back Light

5½" 60 LEDs

Specifications - Volt-Amps Consumed for 5.5" LED Signals

Version	Red	Yellow	Green	White
60 LED	5.6	5.2	5.6	5.6
90 LED	7.1	6.0	6.5	6.5
120 LED	8.0	8.0	8.0	8.0

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

Type AT
Color Light Signals

Features

- **Narrowest signal on the market**
- **Ideal for places with minimal clearance**
- **Available in both LED and incandescent types**
- **Option of LED or enameled number plates**
- **Available in pole, wall, hat and horizontal mounted configurations**
- **Easy access to the transformer terminal block and the wiring from the back of the signal**
- **All external protruding bolt threads have been eliminated to safeguard workers from cuts and injuries**

The **Type AT Color-Light Signal** is a compact unit designed for rapid transit lines where clearances are very limited. The Type AT Signal, ideal for underground (tunnel) installation, is equipped with a single optical lens since the efficiency of a doublet lens is not required in a dark environment. The 5” (12.7 cm) lens has a 3.5” (8.9 cm) focal length. The lens may be specified in red, yellow, green, lunar white or clear. The modular design of the Type AT Signal permits multiple units to be bolted together, one atop the other, for the desired signal configuration. These signals are typically supplied with mounting brackets for subway walls or ceilings. When space is limited, the AT is the perfect solution.

Specifications

Data	AW Signal	AT Signal
Height	39.75" (100.97 cm)	28.75" (73.03 cm)
Width	12.75" (32.39 cm)	9.06" (23.01 cm)
Depth	8.736" (22.19 cm)	6.13" (15.57 cm)
Aspect to Aspect Distance	9.75" (24.27 cm)	5.75" (14.61 cm)
Diameter of Outer Lens	6.38" (16.21 cm) Dia.	5" (12.70 cm) Dia.
Number Plates	LED or Enameled	LED or Enameled
Case Material	Aluminum	Aluminum
Bulb Operating Voltage	8-13 Volts	8-13 Volts
Bulb Wattage	18 Watts and 25 Watts	5 Watts
Transformer Specification	120/10 V Step Down	120/10 V Step Down

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Type AW
Color Light Signals

Features

- **All repairs from back of the signal, Including replacement of the outer lens**
- **Suitable for both LED and incandescent applications**
- **Ideal for tunnel and wayside applications**
- **Quick change-out mounting plates for terminal block from the back of the signal**
- **Simplified receptacle and door hasp design**
- **Integrated door hinges reduce the time that's required to remove or assemble the door by nearly 75%**
- **Reduces spare part inventory by up to 40%**
- **Option of LED or enameled number plates**
- **Available in pole, wall, hat and horizontal mounted configurations**
- **All external protruding bolt threads have been eliminated to safeguard workers from cuts and injuries**

The Type AW Color-Light Signal is a compact signal designed for outdoor applications on rapid transit lines. This incandescent signal uses a doublet lens combination. The 6.375" (16.2 cm) clear outer lens has a 3.75" (9.53 cm) focal length. The 5.50" (13.97 cm) inner lens maybe ordered in red, yellow, green, lunar white or clear. The LED signal uses a single clear roundal with a LED module behind the roundal inside the case. The modular design of the Type AW Signals permits multiple units to be bolted together, one atop the other, for the desired signal configuration. Enhanced design reduces spare part requirements, simplifies maintenance and lowers cost of ownership by up to 35% while delivering safe, reliable service. The AW's flexibility makes it ideal for both wayside and tunnel installations.

Ordering Information

The Type AW and Type AT Color-Light Transit Signals are available in many different arrangements of subassemblies and aspects with numerous options. Please contact the ALSTOM Customer Service Center at 1-800-717-4477 for assistance in ordering a signal for your specific application.

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

AURORA™ 8" and 12" LED Retrofit
Highway Crossing Signal

Features

12" AURORA 300

- **Brightest signal available in the market – 1600 cd on axis**
- **Independent bright white LED side lights for best viewing**
- **Regulated power supply – LED unit emits constant light output even at low voltages**
- **Red high impact UV stabilized outer lens**
- **No focusing required**
- **Compatible with all standard highway crossing signal housings**
- **Voltage turnoff at 7.5 volts**
- **No phankill required**

The **AURORA™ Highway Crossing Signal** uses rugged Light Emitting Diode (LED) technology as the light source instead of a conventional incandescent, filament bulb. The result is an extraordinarily reliable highway crossing signal with a life expectancy of up to 100,000 hours, which is twenty times greater than an incandescent bulb-based system.

The AURORA signal virtually eliminates phantom signals since it contains no reflector dish. Phankills are not required.

The AURORA Highway Crossing Signal is compatible with most AC and DC-based control systems for fast, economical installation. AURORA Retrofit Kits let you replace existing signals in the field. The kit contains everything you need to replace conventional bulb-based signals from:

- **GRS**
- **Western-Cullen-Hayes**
- **Premier Products**
- **Modern Industries (Harmon)**
- **Union Switch & Signal**
- **Safetran Systems**

AURORA Highway Crossing Signals are ideal for front-light, back-light or cantilever applications. The signal meets chromaticity requirements for red as recommended by AAR Manual Part 7.1.10, CIE PUB 2.2-1975 and ITE VCSH 8.04. It also complies with the Manual On Uniform Traffic Control Devices.

T.O.C.

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AURORA™ 8" and 12" LED Retrofit
Highway Crossing Signal

Features

12" AURORA 160

- **Low cost – high intensity – 830 cd on axis**
- **Independent bright white LED side lights for best viewing**
- **Regulated power supply – LED unit emits constant light output even at low voltages**
- **Red high impact UV stabilized outer lens**
- **No focusing required**
- **Compatible with all standard highway crossing signal housings**
- **Voltage turnoff at 7.5 volts**
- **No phankill required**

Performance Standards

Parameter	Standard
Environmental Requirements	• 2004 AREMA Standard Class B • MIL-STD 810F
Operating Temperature	-40°C to 70°C
IP Rating	IP65
Electronic Noise	Meets AREMA Standard
Storage Temperature	-55°C to 85°C
Photometric Requirements	Transport Canada Standard

Specifications

Data	AURORA 300	AURORA 160
Operating Voltage Range	8 – 20 VDC 8 – 17 VAC	8 – 20 VDC 8 – 17 VAC
Power Factor	>90%	>90%
Nominal Current Draw (at 10 VDC)	1.2 Amps	0.75 Amps
Typical Power Consumption (at 10 VDC)	12 Watts	7.5 Watts
Peak Intensity on Axis (Candelas)	1600 cd	830 cd

Ordering Information

Product Name	Description	Ordering Number	Price
AURORA 160	12-inch AURORA Highway Crossing Signal Retrofit Kit	59649-200-02	$ 200.00
AURORA 300	Ultra Bright 12-inch AURORA Highway Crossing Signal Retrofit Kit	59649-200-03	$ 249.00
AURORA 160	12-inch AURORA Highway Crossing Signal Complete with Housing, 20-inch Dia. Background and Hood	59649-200-04	$ 569.00
AURORA 300	Ultra Bright 12-inch AURORA Highway Crossing Signal Complete with Housing, 20-inch Dia. Background and Hood	59649-200-05	$ 995.00
AURORA 8"	8-inch AURORA Highway Crossing Signal Retrofit Kit	59649-202-02	$ 359.00

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

AURORA™ LEDs
Complete Highway Crossing Signals

The new **ALSTOM Complete Highway Crossing Signals** are now available for purchase. The housings are aluminum and the backgrounds are powder coated, galvanized steel. Two or four unit housings are available in various configurations including 8" or 12" signal units with either LED or incandescent lights and 4" or 5" pole sizes. These truly versatile Highway Crossing Signals will drastically simplify specifying, maintaining and operating your signals.

Specifications

Ordering Number	Signals	Signal Unit	Pole Size (inches)
55050-016-00	2 Signals	8 Inch with LED Module	4
55050-017-00	2 Signals	8 Inch with LED Module	5
55050-018-00	2 Signals	12 Inch with 160 LED Module	4
55050-019-00	2 Signals	12 Inch with 300 LED Module	4
55050-020-00	2 Signals	12 Inch with 160 LED Module	5
55050-021-00	2 Signals	12 Inch with 300 LED Module	5
55050-022-00	2 Signals	8 Inch with Incandescents	4
55050-023-00	2 Signals	8 Inch with Incandescents	5
55050-024-00	2 Signals	12 Inch with Incandescents	4
55050-025-00	2 Signals	12 Inch with Incandescents	5
55050-026-00	2 Signals	8 Inch with LED Module	4
55050-027-00	2 Signals	12 Inch with 160 LED Module	4
55050-028-00	2 Signals	12 Inch with 300 LED Module	4
55050-029-00	2 Signals	8 Inch with Incandescents	4
55050-030-00	2 Signals	12 Inch with Incandescents	4
55050-046-00	2 Signals	8 Inch with LED Module	5
55050-047-00	2 Signals	12 Inch with 160 LED Module	5
55050-048-00	2 Signals	12 Inch with 300 LED Module	5
55050-049-00	2 Signals	8 Inch with Incandescents	5
55050-050-00	2 Signals	12 Inch with Incandescents	5
55050-041-00	2 Signals	8 Inch with LED Module	5
55050-042-00	2 Signals	12 Inch with 160 LED Module	5
55050-043-00	2 Signals	12 Inch with 300 LED Module	5
55050-044-00	2 Signals	8 Inch with Incandescents	5
55050-045-00	2 Signals	12 Inch with Incandescents	5
55050-031-00	4 Signals	8 Inch with LED Module	4
55050-032-00	4 Signals	8 Inch with LED Module	5
55050-033-00	4 Signals	12 Inch with 160 LED Module	4
55050-034-00	4 Signals	12 Inch with 300 LED Module	4
55050-035-00	4 Signals	12 Inch with 160 LED Module	5
55050-036-00	4 Signals	12 Inch with 300 LED Module	5
55050-037-00	4 Signals	8 Inch with Incandescents	4
55050-038-00	4 Signals	8 Inch with Incandescents	5
55050-039-00	4 Signals	12 Inch with Incandescents	4
55050-040-00	4 Signals	12 Inch with Incandescents	5

For assistance in ordering any of these Complete Highway Crossing Signals, please contact the ALSTOM Customer Service Center at 1-800-717-4477

T.O.C.

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AURORA™ LED
Gate Arm Light

The AURORA™Gate Arm Light is a cost-effective solution to expensive, incandescent type gate arm lights. The AURORA Gate Arm Light uses rugged Light Emitting Diode (LED) technology instead of a fragile filament bulb for illumination. Each AURORA light has four wires for the electrical connection. Like the AURORA Highway Crossing Signal, it offers customers an extraordinary life expectancy of up to 100,000 hours.

The AURORA Gate Arm Light uses less than 20% of the power required by a conventional incandescent bulb-based system. It is housed in an impact resistant plastic housing. The lights are designed to hold up to“knockdowns”.

Features

AURORA Premium GAL 200

- **Quick Install - Complete installation in only ten minutes with one tool**
- **Complete kit with “PLUG-IN” connectors and coil cords**
- **Brightest LED gate arm light available in the market (Each unit contains 36 Ultra Bright or Super Bright LED’s)**
- **LED viewing angle of 30 degrees (Most LED’s in the market have 15 degree viewing)**
- **Exceeds the AREMA recommended 70 degree beam spread**
- **Tested for over 200,000 operations without a single LED failure**
- **Can be used with highway crossing systems of any make and model**

AURORA Standard GAL 100

- **Most cost-efficient LED gate arm light available in the market**
- **Brightest LED gate arm light available in the market (Each unit contains 36 Ultra Bright LED’s)**
- **LED viewing angle of 30 degrees (Most LED’s in the market have 15 degree viewing)**
- **Exceeds the AREMA recommended 70 degree beam spread**
- **Tested for over 200,000 operations without a single LED failure**
- **Can be used with highway crossing systems of any make and model**

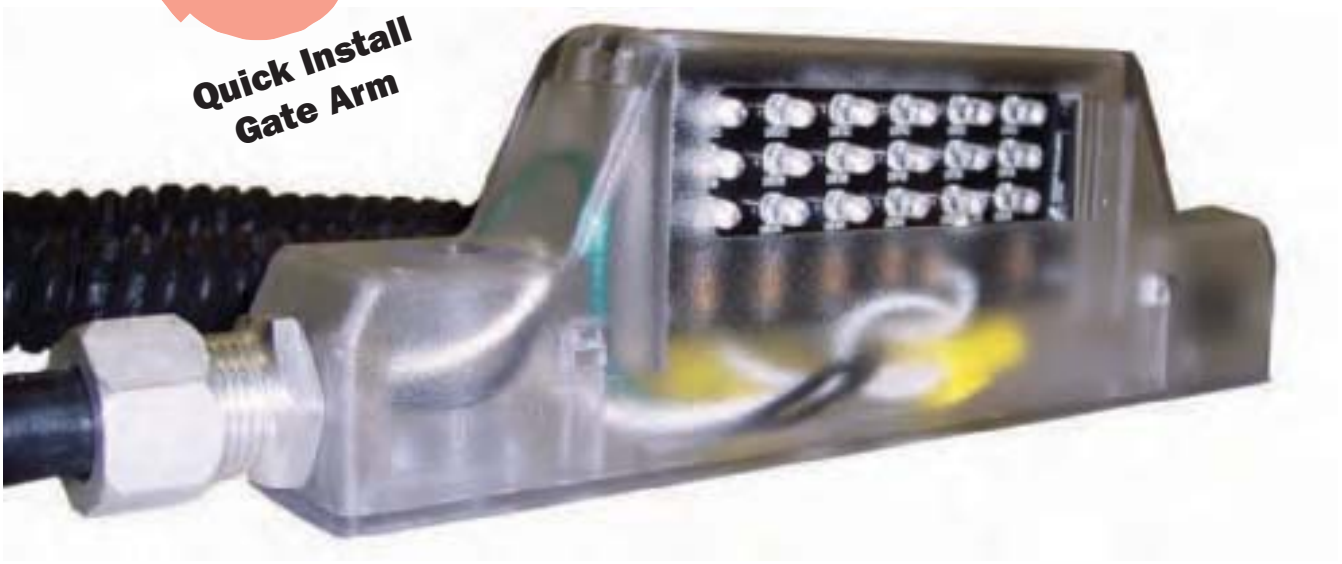
T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

AURORA™ LED
Gate Arm Light

NEW

Quick Install Gate Arm



Specifications

Data	Value
Operating Voltage	8.5 V AC/DC – 12 V AC/DC
Minimum Forward Current	10 mA
Recommended Operating Voltage	10 VDC
Typical Max. Forward Current Draw(at 10 VDC)	0.35 Amps
Typical Max. Power Consumption (at 10 VDC per gate light)	3.5 Watts

Performance Standards

Parameter	Range
Vibration (X, Y and Z axis)	• 2001 AREMA Standard • MIL-STD 810F
Operating Temperature	-40°C to 70°C
P Rating	IP65
Electronic Noise	Meets AREMA Standards
Storage Temperature	-40°C to 85°C

Ordering Information

Product Name	Description	Ordering Number	Price
AURORA Standard GAL 100	Set of three Ultra Bright Gate Arm Lights with installation hardware	59649-201-01	$ 259.00
AURORA Premium GAL 200 Quick Install	Set of three Ultra Bright Gate Arm lights with quick connect coil cords and hardware	59649-201-03	$ 379.00

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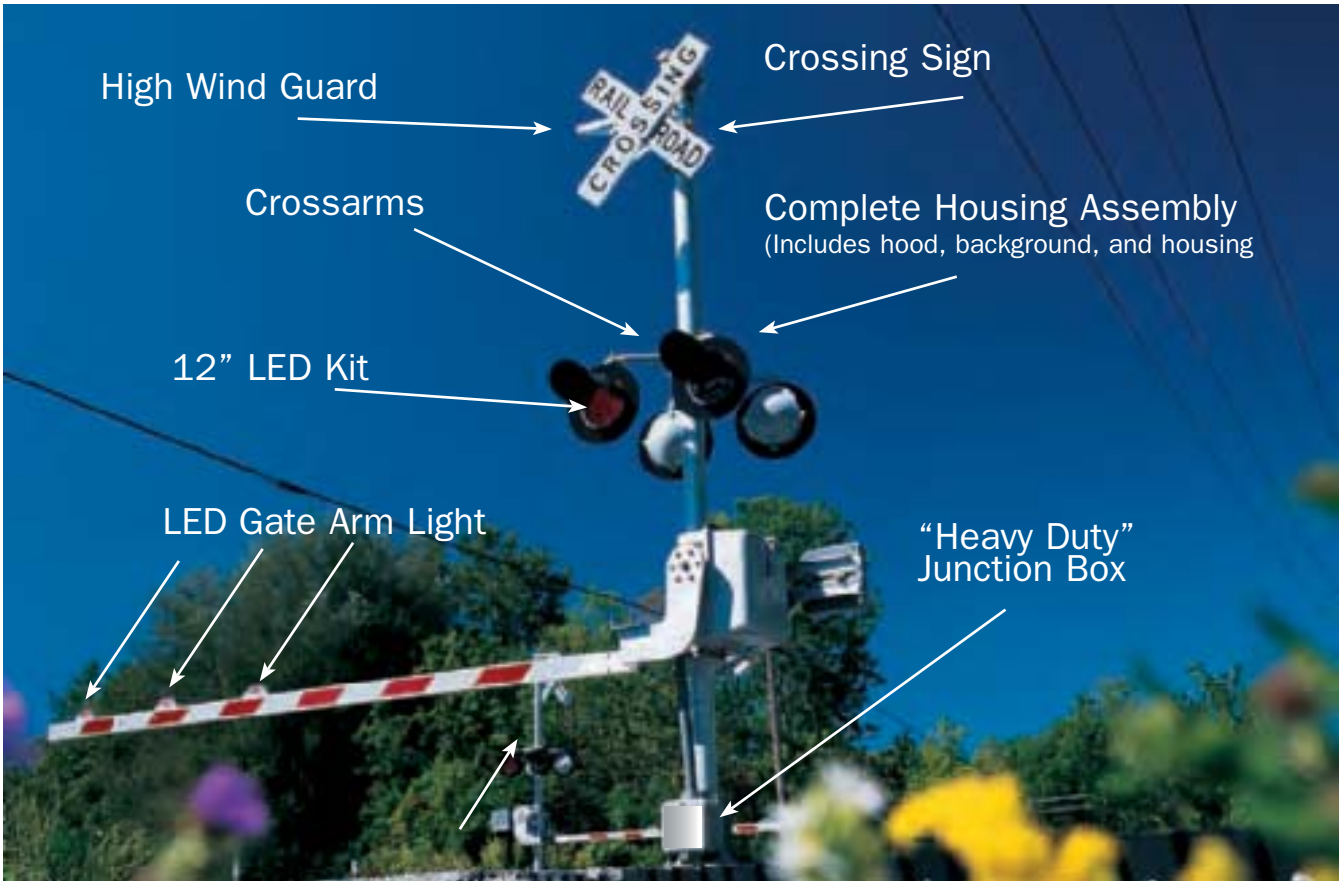
Highway Crossing Components



Also available from ALSTOM are additional highway crossing components other than the AURORA LED flashing light retrofit kits and AURORA LED gate arm kits:

- **HIGH WIND GUARD**
  Protects the gate arm from possible damage due to strong winds
- **CROSSING SIGN**
  "RAILROAD CROSSING" crossbuck sign
- **FLASHING LIGHT HOUSING ASSEMBLY**
  Complete 12" flashing light housing with background and hood. Does not include the LED light kit
- **FLASHING LIGHT UNIT CROSSARMS**
  For two light units or four light units
- **JUNCTION BOX**
  Heavy duty junction box for electrical hookups
- **BELL**
  For mounting on top of mast

Ordering Information

Description	Ordering Number	Price
High Wind Guard	55329-006-00	$ 149.00
12" LED Kit	59649-200-02	$ 200.00
LED Gate Arm Light - Premium GAL 200	59649-201-03	$ 379.00
LED Gate Arm Light - Standard GAL 100	59649-201-01	$ 259.00
"Heavy Duty" Junction Box	52918-009-01	$ 749.00
Complete Housing Assembly 12" (Includes: Case, terminal block, 20" dia. background, and hood.) Does Not Include LED Light Kit	55051-013-00	$ 995.00

For assistance in ordering any of these Highway Crossing Components, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

PL100 Bayonet-Style Position Light LED

Features

- **State-of-the-art High Intensity Surface Mount LEDs with Integrated Lens**
- **Robust, Heavy Duty Packaging**
- **Compatible with Standard Bayonet Lamp Sockets**
- **Designed with LEDs to be at same dimensional position as bulb filament in typical assemblies**
- **Long Life LED Technology Reduced Maintenance Costs from Lamp Burn-outs**
- **Available in Lunar White**

Specifications

Data	Value
Operating Voltage Range	8.5V to 12.0 VDC or AC
Nominal Current Drawn (at 10V DC)	0.3A
Typical Power Consumption	3W at 10VDC
Minimum Luminous Flux (lumens at 10V DC)	100 Lm
Environmental Requirements	• 2004 AREMA Standard Class B • MIL-STD 810F
Operating Temperature Range	– 40°C to 70°C

Ordering Information

Product Name	Description	Ordering Number	Price
PL100 Bayonet-Style Position Light LED (Lunar White)		47437-034-00	$ 59.00

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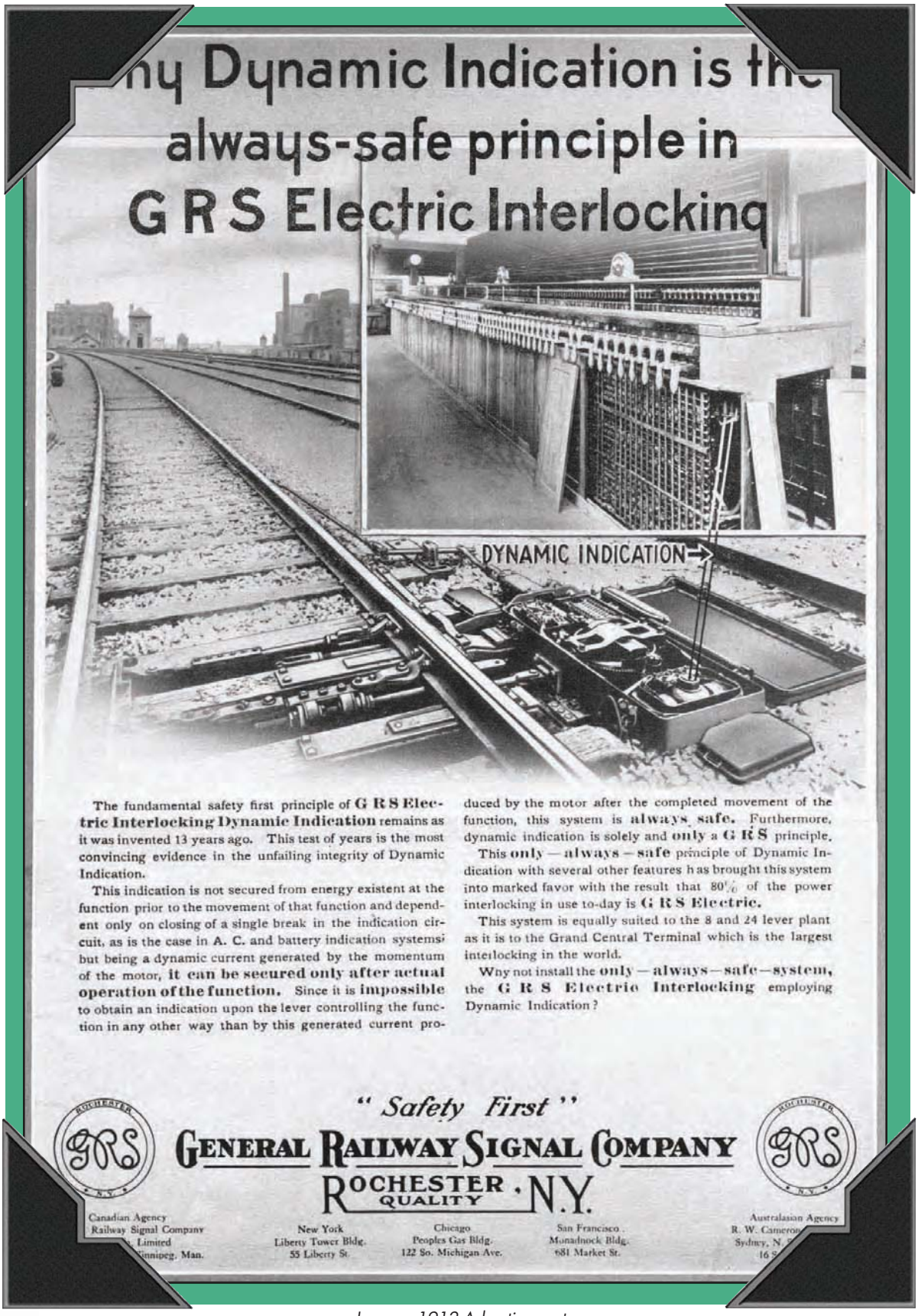
ny Dynamic Indication is the
always-safe principle in
G R S Electric Interlocking
DYNAMIC INDICATION
The fundamental safety first principle of G R S Electric Interlocking Dynamic Indication remains as it was invented 13 years ago. This test of years is the most convincing evidence in the unfailing integrity of Dynamic Indication.
This indication is not secured from energy existent at the function prior to the movement of that function and dependent only on closing of a single break in the indication circuit, as is the case in A. C. and battery indication systems; but being a dynamic current generated by the momentum of the motor, it can be secured only after actual operation of the function. Since it is impossible to obtain an indication upon the lever controlling the function in any other way than by this generated current produced by the motor after the completed movement of the function, this system is always safe. Furthermore, dynamic indication is solely and only a G R S principle.
This only — always — safe principle of Dynamic Indication with several other features has brought this system into marked favor with the result that 80% of the power interlocking in use to-day is G R S Electric.
This system is equally suited to the 8 and 24 lever plant as it is to the Grand Central Terminal which is the largest interlocking in the world.
Why not install the only — always — safe — system, the G R S Electric Interlocking employing Dynamic Indication?
"Safety First"
GENERAL RAILWAY SIGNAL COMPANY
ROCHESTER QUALITY N.Y.
Canadian Agency
Railway Signal Company
Limited
Winnipeg, Man.
New York
Liberty Tower Bldg.
55 Liberty St.
Chicago
Peoples Gas Bldg.
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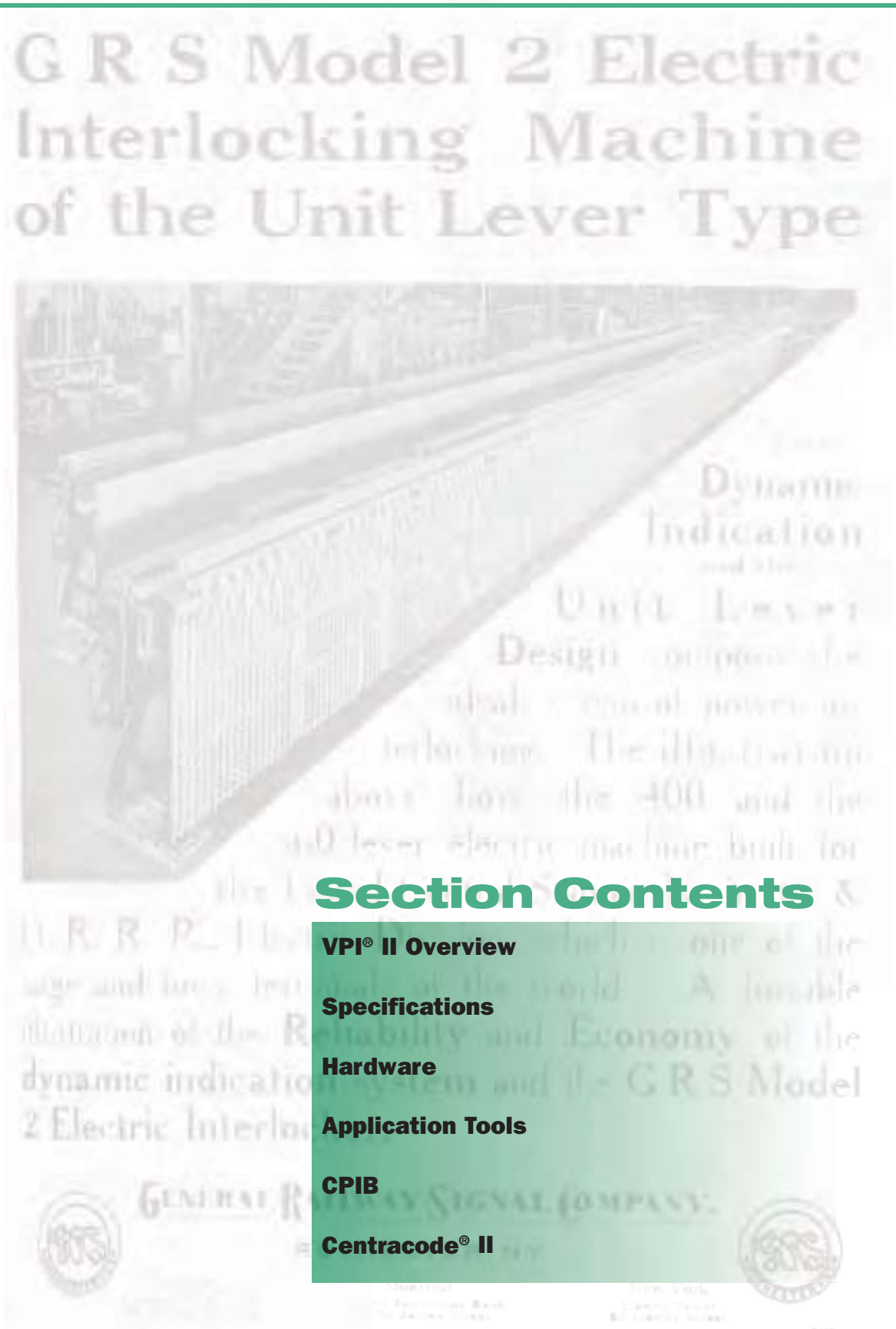

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VPI® II Overview

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Hardware

Application Tools

CPIB

Centracode® II

T.O.C.

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VPI® II Vital and Non-Vital
Interlocking Control

ALSTOM is a World Leader in VPI Vital Microprocessor Interlocking Control Systems with Integrated Code/Communication System Emulation and Non-Vital Functions

ALSTOM **VPI® Interlocking Control Systems** have set the worldwide standard for microprocessor-based interlocking control. The newly expanded family of ALSTOM microprocessor products and components makes these integrated, modular systems the best value ever, so you can lower the total life cycle cost of your system.

From the smallest end-of-siding to giant installations like Grand Central Terminal in New York City, the VPI system and ALSTOM microprocessor-based components help meet your needs for vital and non-vital wayside control and communication. The microprocessor-based VPI Interlocking Control System performs vital logic with the highest level of safety that is fully equal to relay based systems. And the VPI Interlocking Control System is thoroughly field proven. Since the first installation in 1986 there have been no unsafe failures, an unblemished record of VPI Controlled Vital System Operation in excess of 72,000,000 hours.

The VPI system has been formally verified or audited for safety by the London Underground Limited, Dutch National Railway, CP Rail, Metro-North Commuter Railroad, Queensland Railroad (Australia), and Bay Area Rapid Transit (BART).

Today you can use ALSTOM microprocessor-based interlocking products to handle both vital and non-vital functions cost-effectively. These products include the widest range of enhancements and easiest troubleshooting available.
You can easily interface VPI systems to other vital and non-vital wayside equipment, local control panels, and central office provided by ALSTOM or other suppliers.

VPI system software includes extensive self diagnostic capability. Diagnostic and system monitor routines in the software can be used to diagnose and isolate failures and to provide status information about the its internal processing.

Because of these built-in capabilities, most maintenance, troubleshooting and system testing tasks require only a simple terminal interface such as a laptop or hand-held terminal to isolate the failure to a specific circuit board or input/output port. This makes testing simple and straightforward.

In addition, the VPI system provides maintenance LEDs on each PC board. The LEDs provide the maintainer with indications of input and output status, and of proper communication among all system boards. With the optional MMS (Maintenance Management System), you can continuously monitor and download logged event data from a VPI system from any convenient site through network phone lines, direct wiring, and/or data radio.

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

VPI® II Vital and Non-Vital
Interlocking Control

VPI II

The latest generation of interlocking control is focused on improved performance and maintainability. The introduction of the VPI II addresses the full cycle of interlocking control with improvements in design, verification, test functions and maintenance. This achieves a significant increase in system performance. Some of the key features of the VPI II are:

System Architecture
With increased processing capacity and network connectivity, VPI II provides industry leading flexibility in interlocking application and partitioning. Options allow for distributed or centralized traffic control through networked main processing and I/O and point of issue diagnosis for system faults. More system wide control can be performed in a single system to meet the demands of the application. This reduces the overall number of systems required, and improves overall performance as there are fewer systems exchanging time critical interlocking control and status parameters.

System Condition Monitoring
VPI II's newest Maintenance Management System allows easy access to the system's operational status, troubleshooting of failed components, and configuration management of hardware and software. All "smart" system components that pass information over the integrated network are readily available to maintenance, engineering and/or dispatch centers for tracking system operation.

Product Roadmap
All future evolutions of the VPI II product line will involve a major emphasis on reducing post-commissioning operational costs and increasing system performance as demands for lower headways and increased ridership occur. The new CPU II main processor provides the processing horsepower to accomplish this goal.

Local or Centralized Maintenance Management System
Significantly improves mean time to restore through advanced diagnostics, streamlined field tests, and utilities for extensive site data management such as event logs and configuration information.

Upgraded Central Processor
Extended capacity for larger interlockings which results in decreased train routing latencies.

Network Capability
The VPI II has a flexible system for partitioning through efficient communication of signaling control, fault diagnosis and vital and non-vital health monitoring information.

LED Signal Drive
Upgraded adjustment and monitoring features improve setup and maintenance of LED Signal Aspects.

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VPI® II Vital and Non-Vital
Interlocking Control

Features

- **Proven**
  No unsafe failures since the first installation in 1986
  Total hours of VPI Controlled Vital System Operation in excess of *72,000,000* hours
- **Expandable**
  From end-of-siding, to interlockings with up to 35 switch machines
- **Flexible**
  Modular architecture
  Forward and backward compatibility
- **Cost-Effective**
  VPI will lower your system's life cycle costs
- **Easy to Maintain**
  Self diagnostics make the system virtually maintenance-free
- **Integrated**
  High degree of subsystem integration

Specifications - VPI® Module (Chassis and Boards)

Data	Value
Logic Input Power	5 VDC (+ 0.25) at 8 Amperes max. per module
High Voltage Isolation Rating	Meets AREMA requirements
Operating Temperature	-40 to +160 F (-40 to +70 C)
Humidity	0 to 95% Non-Condensing
Typical Weight per module (with some boards)	15 lbs. (6.80 kg)
Dimensions	14" H x 19" W x 23" D (35.6 cm H x 48.3 cm W x 58.5 cm D) (Depth includes cable dress at rear chassis)

Ordering Information

For assistance in ordering chassis and boards for your system or for assistance in selecting and configuring a new system or addition please contact the ALSTOM Customer Service Center at 1-800-717-4477

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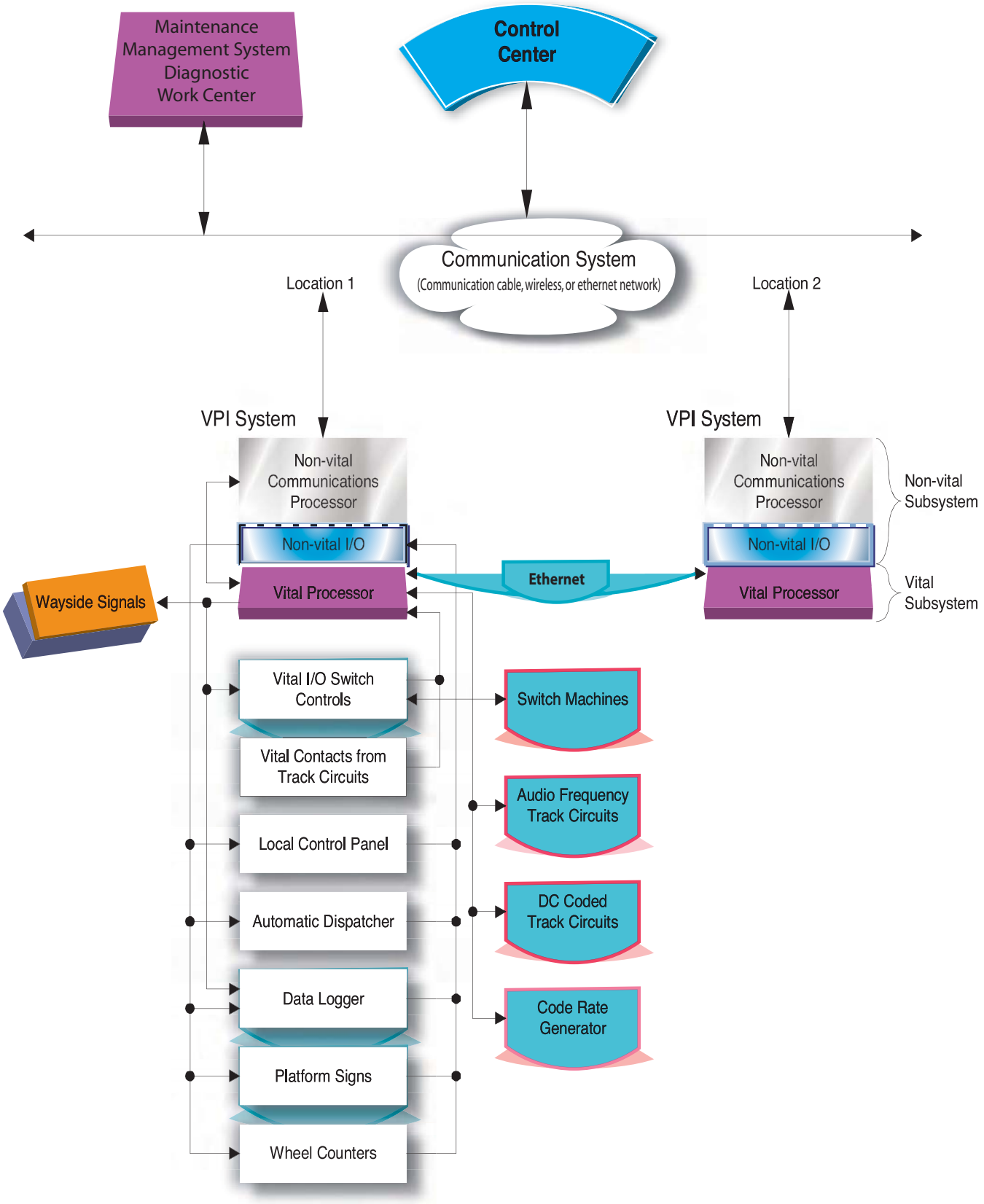
VPI® II System
Block Diagram



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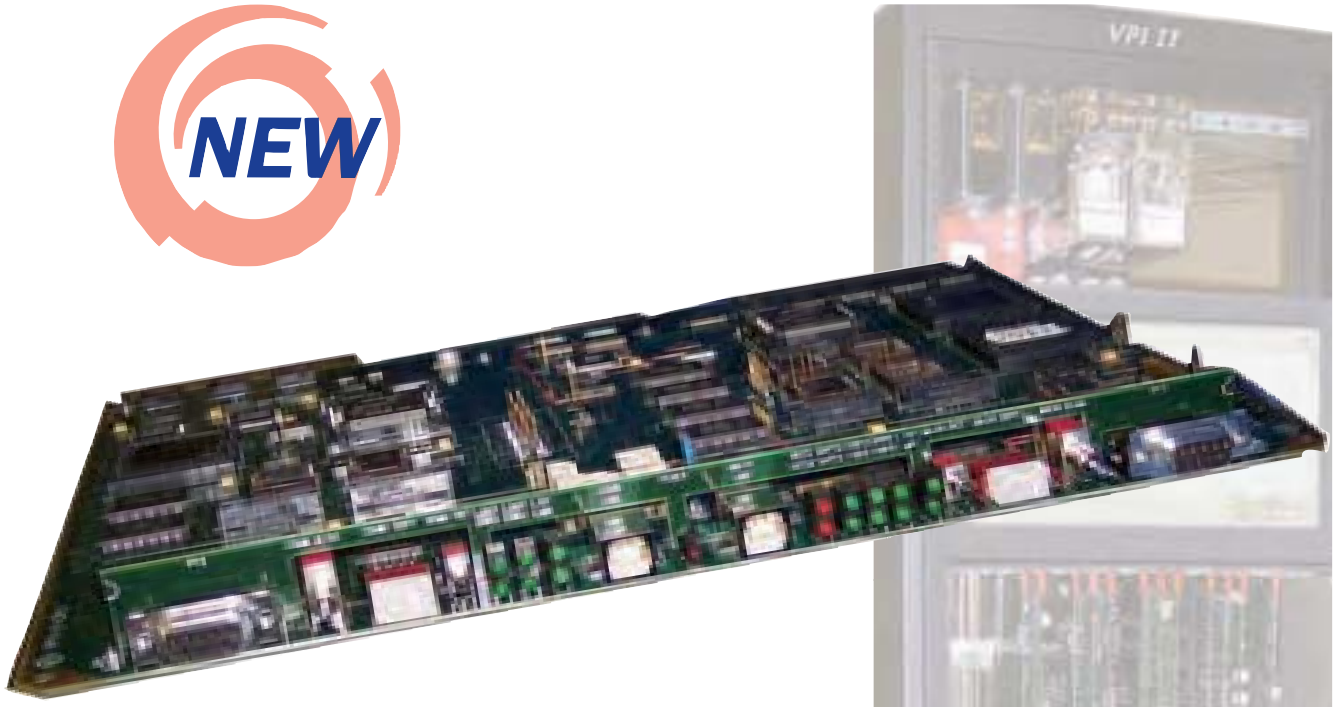
VPI® II Network Connectivity

The Next Step for Interlocking Control



Introduction

VPI II represents the next generation of controlling interlockings which focus on improving performance and system maintainability. VPI II network connectivity recognizes the current and future applications require flexible system partitioning and efficient communication of signal control, fault diagnosis and health monitoring (both vital and non-vital) information.

VPI II's on-board network capability can now utilize customer installed network systems and reduce dependencies on dedicated line and fiber circuits, reducing both the initial cabling expense as well as future related maintenance requirements.

To meet the needs of Signal Engineers in providing application solutions for Interlocking and Train Control, ALSTOM has released the next generation of VPI II with the following improvements:

The following is a brief, high-level summary of the CPU II and CSEX3 modules that are the integral pieces of the VPI II system.

CPU II Module

The CPU II is the vital system board for VPI II that incorporates vital logic processing, vital I/O control and monitoring, on-board programming, extended capacity for large interlocking controls and communications between same systems within the train control room and room to room. CPU II contains two microprocessors that separately perform the vital processing and the high-speed communications functions.

The communication layer contains a network stack while the applications layer allows the Signal Engineer to develop the application logic for the interlocking or train control system. Combined with tools contained in the CAAPE package, the Signal engineer can read / download / upload the system software and application data structures to Flash PROMs. The separate processors minimize any impact to the vital system while communicating with other system boards with a similar network interface capability.

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VPI® II Network Connectivity

CSEX3 Module

The CSEX3 (Extended Code System Emulator 3) board is compatible with both past generation CSEX boards as well as future communication systems, which are the"backbone" of centralized traffic control (CTC) systems. The CSEX3 provides a multi-tier software structure that provides: Board level functionality such as data logging, diagnostics, and a dual ported RAM (DPRAM) interface shared by the CSEX3 and the CPU II Communication system interface and application logic for non-vital programming requirements. The CSEX3's ability to simultaneously manage multiple communication protocols is a key feature that allows communication with multiple devices as well as the ability to upgrade a communication network incrementally through system programming rather than through extensive hardware and software changes. Below is a listing of supported protocols. ALSTOM is in the process of releasing a plug-in "auxiliary board" that allows for hardware configuration changes to support network communication solutions over an Ethernet interface.

Supported Protocols

Manual	Company Name/Protocol Description
P2346A	Algemene Sein Industrie B.V., ASI by Netherlands Spoorwegen (NS) / Lokale Controle Eenheid (LCE)
P2346B	Westinghouse Brake & Signal / S2
P2346C	ALSTOM / GRS K-K2
P2346D	ALSTOM / GRS DataTrain IV
P2346E	ALSTOM / GRS DataTrain VIII
P2346F	Union Switch & Signal / Genisys
P2346G	Union Switch & Signal / 504, 506, 514
P2346H	Safetran / SCS128
P2346LDTS	LG Industrial Systems / LDTS
P2346M	Modicon / Modbus RTU
P2346N	ALSTOM / GRS DataTrain II
P2346P	Rockwell International / Advanced Railroad Electronic System
P2346Q	Canadian National RR / CN2000
P2346R	GE/Harmon / MCS1
P2346S	ALSTOM / GRS J-Code
P2346T	Bailey / S9600
P2346U	Advanced Train Control System Wayside Interface Unit, Specification 3 & 4
P2346X	Hanning & Kahl / HCS-R radio control route equipment
P2346Y	ALSTOM Signal Netherlands for PRORAIL / OPCE
None	ASCII

Note: CSEX3, all protocols included with CAAPE

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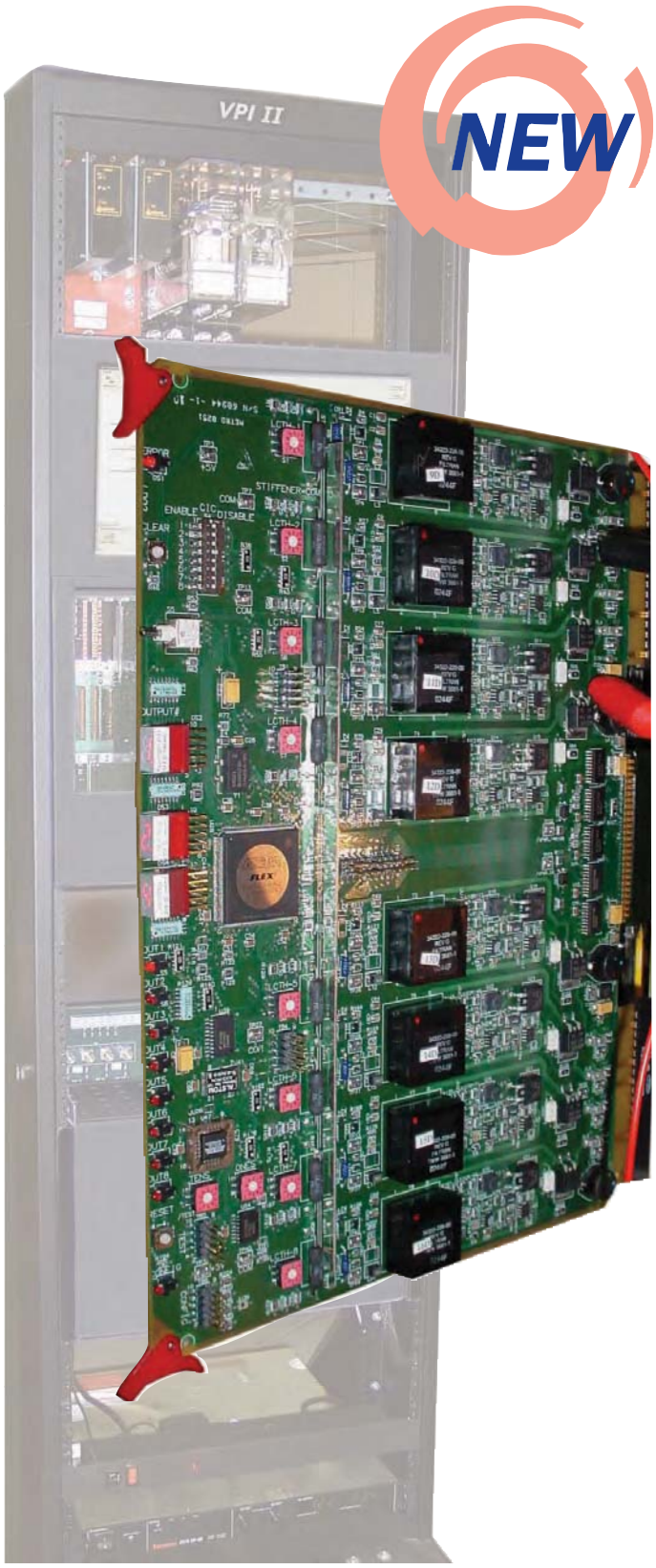
VPI® II Lamp Driver
Output Module (LDO2)



LDO2 (LAMP DRIVER OUTPUT) MODULE

The new Lamp Driver Output Board is a vital output board used to provide power to signals for both transit and railroad applications. Using the same proven vital techniques, found on other VPI vital output boards; the new LDO2 includes the following features:

- **Current Monitoring** - reads the current through the output every 200 milliseconds. This current can be compared to one of eight different threshold levels from 0.0 to 3.25 Amps, which will turn the output off if it is not drawing the minimum required current. The filament checking routines enables down grading and prevents against overcurrent and short protection.
- **Cable Integrity Check** - uses isolated voltage sensing at the output to determine if a potential exists across the output when the output is off. A separate switch for each output can be used to select the system reaction to this event by logging the error or dropping a vital relay.
- **Diagnostic Interface to VPI CPU II Board** - registers all current readings and error conditions and can be read or cleared via the CPU II board.
- **Board Edge User Interface** - registers all current readings and error conditions and can be read or cleared alternatively via the Board Edge User Interface.

Call Customer Service at 1-800-717-4477 for more information

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Features

Circuit Modules

- **CPU II/Polynomial Divder**
  All vital application logic is stored on this board and executed from it

  Performs calculations necessary for evaluating expressions and verifying the system program, guaranteeing proper system operation
- **Vital Relay Driver**
  Receives system information, vitally processes it and, if correct, provides output to vital disconnect relay
- **Input/Output Interface**
  Provides proper interface to vital inputs and outputs
- **VPI Supervisory Communications and Control Subsystem**
  Extended code system emulator performs non-vital applications functions
- **Vital Serial Controller**
  Communicates vital information between VPI systems via serial transmission link, no line wires needed

  Incorporates full duplex communication up to 19,200 bps, with Manchester encoding and extended CRC check to ensure data integrity

ALSTOM can customize the VPI to many specific requirements. Different hardware configurations can be designed with one processor controlling up to 35 switch machines, related track circuits and signals. This is accomplished through the availability of up to 320 vital inputs and 320 vital outputs, 640 non-vital I/O ports and vital and non-vital communication interfaces. The VPI module has 21 slots for circuit boards and it mounts in a standard 19-inch rack. A single VPI system may be comprised of more than one module, depending on the amount of vital I/O and system logic that is required. The module is designed to be flexible and expandable. Printed circuit boards may be located in a variety of slots, depending on your requirements. Additional expansion modules are interconnected by ribbon cables. Input/output cables are connected directly to edge connectors on the boards to minimize cable connections. Optional configurations are available using standard AMP Type M connectors mounted on the rear panel (28-way connectors for vital functions, 50-way or 75-way for non-vital functions), direct wire interfaces or backplane cards with WAGO style connectors.

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VPI® II Hardware

Chassis Configurations

- **PLUG COUPLED CHASSIS**
  The VPI II plug coupled chassis includes internal cable harness assemblies. These assemblies connect the VPI II PCB I/O point(s) to a series of AMP type M-series plug couplers, mounted on the rear panel of the chassis. The rear panel also contains a 14-pin type M-series plug coupler for the 5 VDC power connection and provisions for up to four 60-way ribbon cable connectors for connecting to expansion chassis.

- **DIRECT WIRE CHASSIS**
  The direct wire chassis is configured to allow the I/O wiring to be economical by directly inserting wire into the PCB edge connectors in the chassis. This chassis configuration does not allow for quick removal of the chassis from a wired rack. However, all the PCBs can be removed and no active electronic components are left in the chassis. This version is intended for applications where the rack housing this chassis provides a plugcoupled connection to the other interlocking equipment.

- **CONTROL POINT in a BOX (CPIB) CHASSIS**
  The CPIB interface chassis uses Back Plane Interface Cards (BPIC) with WAGO style (spring cage clamp) wire termination blocks and printed circuit board edge connectors to map the I/O termination points on the VPI II PCBs to discrete wire connectors. The chassis is designed to allow these interface PCBs to be inserted and removed from the rear of the chassis. This provides a wire termination method that can be quickly disconnected (by removing the printed circuit boards) and individual I/O points may be disconnected for troubleshooting. This chassis style is intended for low density applications.

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Ordering Information - Vital Central Processor Unit

Features

- Performs calculations necessary for evaluating expressions and verifying the system program, guaranteeing proper system operation.
- All vital application logic stored on this board and executed from it.

Ordering Number	Description	Price
31166-374-01	CPU II Board, system sftw included w/CAAPE	Call for Pricing
31166-374-02	CPU II Board w/Communication Processor, system sftw included w/CAAPE	
01169-691-0N	System EEPROMs (PLCC 29F010 FLASH, 2/brd) included w/brd	
01169-767-0N	ADS EEPROMs, (PLCC 29F040 FLASH, 2/brd) included w/brd	
31166-029-32	CPU/PD Board, w/40025-366-00 system sftw	
01169-648-0N	System/ADS EEPROMs (DIP 29F010 FLASH, 4/brd) order ADS PROMs separately	

Ordering Information - Vital Relay Driver

Features

- Receives system information, vitally processes it and, if correct, provides output to vital disconnect relay.

Ordering Number	Description	Price
59473-740-02	VRD Board (9-15 VDC operation)	Call for Pricing
56001-787-05	B1 Relay Neutral, 100 ohms, 4FB, 2F, 1B	

Ordering Information - Input/Output Interface

Features

- Provides proper interface to vital input and output boards and drives system bus in extension chassis.

Ordering Number	Description	Price
59473-827-01	IOB, I/O Bus Interface Board	Call for Pricing
59473-871-01 to 59473-871-04	Signature Header (A – D) respective (Grps 01 – 04) one for each board in system, determined by CAAPE	

Ordering Information - Vital Serial Controller

Features

- Is available for point to point VPI vital communication, VPI multi-drop ATP communications, or VPI multi-drop Genrakode communications.
- Supports an RS232 interface serial transmission link, eliminating the need for line wires. Incorporates full duplex or half duplex communication up to 19,200 bps, with Manchester encoding and extended CRC check to ensure data integrity.

Ordering Number	Description	Price
59473-939-10	VSC Board, 4-Wire pt to pt w/40025-322 sftw	Call for Pricing
59473-939-11	VSC Board, RS232 interface pt to pt w/daughter brd and 40025-322 sftw	
59473-939-12	VSC Board, 4-Wire multi-drop w/ 40025-323 sftw used for ATP	
59473-939-13	VSC Board, 2-Wire multi-drop w/40025-324 sftw used for Genrakode, 15 Parameters /Track	
59473-939-14	VSC Board, 2-Wire multi-drop w/40025-348 sftw used for Genrakode w/T-Code, 25 Parameters/Track	
01169-646-0N	EPROM (DIP 27C128, 1/brd) order separately	

For assistance in ordering chassis and boards for your system or for assistance in selecting and configuring a new system or addition please contact the ALSTOM Customer Service Center at 800-717-4477

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VPI® II Hardware

Ordering Information - Vital Direct Input

Ordering Number	Description	Price
59473-867-01	DI Board, 16 discrete inputs with filtering (9-15 VDC)	Call for Pricing
59473-867-02	DI Board, 16 discrete inputs w/o filtering (9-15 VDC)	
59473-867-03	DI Board, 16 discrete inputs with hold circuit (9-15 VDC)	
59473-867-04	DI Board, 16 discrete inputs with filtering (45-55 VDC)	
59473-867-05	DI Board, 16 discrete inputs with filtering (9-22 VDC)	
59473-867-07	DI Board, 16 discrete inputs with filtering (24-34 VDC)	
59473-871-01 to 59473-871-16	Signature Header (A – P) respective (Grps 01 – 16) one for each board in system, determined by CAAPE	

Ordering Information - Vital Output

Ordering Number	Description	Price
Lamp Driver Output		Call for Pricing
59473-749-02	LDO Board, 8 outputs (9-18 VDC, 2.9 Amp operation, 100mA Threshold)	
59473-749-03	LDO Board, 8 outputs (15-30 VDC, 2.9 Amp operation, 100mA Threshold)	
59473-749-04	LDO Board, 8 outputs w/o Cold Check (9-18 VDC, 2.9 Amp operation, 100mA Threshold)	
31166-340-01	LDO2 Board, 8 outputs (9-18 VDC, 3.3 Amp operation, 100mA Threshold)	
31166-340-02	LDO2 Board, 8 outputs w/o current monitor, (9-18 VDC, 3.3 Amp operation, 100mA Threshold)	
Single Break Output		
59473-739-01	SBO Board, 8 outputs, Supply 9-30 VDC, Output = [Supply - typical 1 VDC], 0.5 Amp, 3mA Threshold	
Double Break Output		
59473-747-01	DBO Board, 8 outputs, Supply 9-15 VDC, Output = [Supply - (5*outAmp)], 0.6 Amp operation, 3mA Threshold, same keying as Group 02 board	
59473-747-02	DBO Board, 8 outputs, Supply 9-15 VDC, 2 x Output = [2*Supply - (5*outAmp)], 0.3 Amp operation, 3mA Threshold	
59473-747-03	DBO Board, 8 outputs, Supply 9-15 VDC, Output = [Supply - (5*outAmp)], 0.6 Amp operation, 3mA Threshold, different keying as Group 02 board	
59473-977-01	DBO Board, 8 outputs, Supply 30-40 VDC, Out 50 VDC, 140 mA operation, 3mA Threshold	
59473-977-02	DBO Board, 8 outputs, Supply 45-55 VDC, Out 50 VDC, 140 mA operation, 3mA Threshold	
AC Output		
59473-937-02	ACO Board, 8 outputs (90-130 VAC, 40-150Hz, 0.8 Amp operation, 100mA Threshold) w/enhanced EMI protection	
59473-937-03	ACO Board, 8 outputs (90-130 VAC, 40-150Hz, 0.5 Amp operation, 5mA Threshold)	
Board Signature Device		
39780-003-01 to 39780-003-40	Signature PROM, one for each output board in a system, determined by CAAPE	
31166-304-01	Selectable Signature PROM, Could be used in place of PROMs 39780-003-01 to 39780-003-40	

Ordering Information - Vital Code Rate Generator

Ordering Number	Description	Price
31166-261-03	CRG Board for solid state code followers; produces codes of 0, 50, 75, 120, 180 pulses per minute and Steady On	Call for Pricing
31166-261-04	CRG Board for vital relay code followers; produces codes of 0, 50, 75, 120, 180, 270, 420 pulses per minute and Steady On	

For assistance in ordering chassis and boards for your system or for assistance in selecting and configuring a new system or addition please contact the ALSTOM Customer Service Center at 800-717-4477

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Ordering Information - Vital Timer

Feature

- Provides up to 8 field-settable vital time delays per board, up to 16 timers per system.

Ordering Number	Description	Price
59473-894-01	FSVT Board, 8 timers (0 – 59:59 sec) for timers one through eight	Call for Pricing
59473-894-02	FSVT Board, 8 timers (0 – 59:59 sec) for timers nine through sixteen	

Ordering Information - Non-Vital Code System Emulator Extended

Feature

- Extended code system emulator; emulates electronic or relay-based code system and also performs non-vital application functions and data logging. Typical functions include local control panel interface and N/X logic.

Ordering Number	Description	Price
31166-175-02	CSEX3 Board, 5 communication interfaces, includes blank EE PROMs	Call for Pricing
31166-175-03	CSEX3 Board, 4 communication interfaces, + 1 DC code, includes blank EE PROMs	
01169-767-0N	System/Application EEPROMs (PLCC 29F040 FLASH, 2/brd)	

Ordering Information - Non-Vital Input

Ordering Number	Description	Price
59473-757-02	NVI Board, 32 high-true inputs (18-33 VDC)	Call for Pricing
59473-757-03	NVI Board, 32 high-true inputs (9-18 VDC)	
31166-276-01	NVID Board, 32 differential inputs, (9-18 VDC) w/switches to force each input on/off	
31166-276-02	NVID Board, 32 differential inputs, (9-18 VDC) no switches	
31166-276-03	NVID Board, 32 differential inputs, (18-33 VDC) w/switches to force each input on/off	
31166-276-04	NVID Board, 32 differential inputs (18-33 VDC) no switches	

Ordering Information - Non-Vital Output

Ordering Number	Description	Price
59473-785-03	NVO Board, (18-33 VDC, 250 mA operation) w/Power On Reset	Call for Pricing
59473-785-04	NVO Board, (9-18 VDC, 250 mA operation) w/Power On Reset	
59473-785-05	NVO Board, (4.5-14.5 VDC, 250 mA operation) w/Power On Reset	
DC Output, sink or (-) output		
31166-123-01	NVO-SNK Board, (4.5-5.5 VDC, 250 mA operation) w/Power On Reset	
Relay Output		
31166-238-01	NVR Board, (0-35 V AC or DC , 1 Amp operation) w/Power On Reset, coil supply from 9-18 VDC	
31166-238-02	NVR Board, (0-35 V AC or DC, 1 Amp operation) w/Power On Reset, coil supply from 18-35 VDC	
AC Output		
59473-936-02	NVOAC Board, (5-250 VDC, 250 mA operation) w/Power On Reset	

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VPI® II Hardware

Ordering Information - Non-Vital Train to Wayside Communication

Ordering Number	Description	Price
VPI Chassis Plug-In Boards		Call for Pricing
31166-099-02	NVTWC-MOD Board, 2-channel TWC for BART	
31166-100-02	NVTWC-MUX Board, Processor Multiplexer for BART	
31166-119-02	NVTWC-FSK Board, 4 channel TWC for MARTA	
31166-119-03	NVTWC-FSK Board, 4 channel TWC for Shanghai, Taipei, Taegu	
31166-119-04	NVTWC-FSK Board, 4 channel TWC for WMATA	
31166-119-05	NVTWC-FSK Board, 4 channel TWC for Seoul Metro Line 6	
Interface Plates and Wayside Cases		
42560-303-01	B2 Plate, TWC track connection interface for BART	
43920-076-01	NVTWC coupling case for BART	
42560-302-01	B1 Plate, TWC track connection interface for MARTA	
42560-307-01	B2 Plate, TWC track connection/ATP interface for Shanghai, Taipei, Taegu	
42560-307-03	B2 Plate, TWC track connection/ATP interface for WMATA	
42560-316-01	B2 Plate, TWC track connection/ATP interface for Seoul Metro Line 6	
42560-317-01	NVTWC coupling case filter for Seoul Metro Line 6	

Ordering Information - VPI Chassis

Ordering Number	Description	Price
Plug Coupler Chassis		Call for Pricing
31506-015-01	21-slot w/divided motherboard slots 5/6 and plug coupler panel (specify bus and I/O cable harness separately)	
31506-015-11	21-slot w/plug coupler panel (specify bus and I/O cable harness separately)	
31506-015-15	21-slot-deep, w/divided motherboard slots 5/6 and plug coupler panel (specify bus and I/O cable harness separately)	
31506-015-16	21-slot-deep w/plug coupler panel (specify bus and I/O cable harness separately)	
Direct Wired Chassis		
31506-015-02	21-slot w/divided motherboard slots 5/6, only bus extension panel (specify bus cables separately)	
31506-015-12	21-slot, only bus extension panel (specify bus cables separately)	
31506-015-03	21-slot w/divided motherboard slots 5/6, no cable panels	
31506-015-13	21-slot, no cable panels	
Control Point In a Box Chassis		
31506-018-01	21-slot w/divided motherboard slots 5/6 for Back Plate Interface Cards	
31506-018-02	21-slot for Back Plate Interface Cards	

For assistance in ordering chassis and boards for your system or for assistance in selecting and configuring a new system or addition please contact the ALSTOM Customer Service Center at 1-800-717-4477

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Ordering Information - VPI Back Plane Interface Card For CPIB Chassis

Ordering Number	Description	Price
31166-194-01	BPIC Vital Output (SBO, DBO, ACO, LDO, LDO2, CRG)	Call for Pricing
31166-195-01	BPIC Vital Direct Input (DI)	
31166-196-01	BPIC Nonvital I/O (NVI, NVO)	
31166-197-01	BPIC VRD and Module Power Interface (VRD)	
31166-198-01	BPIC Vital Serial Communication (VSC)	
31166-199-01	BPIC Non-vital Communication (CSEX3)	
31166-336-01	BPIC Vital Processor (CPU/PD, CPU2 w/o Communication Processor)	
	BPIC, (CRG)	

Ordering Information - DC to DC Power Converter

Features

- Provides the 5-volt VPI logic power
- Provides the 12-volt VRD and DBO power if source is above 15 VDC

Ordering Number	Description	Price
42560-287-03	B2 Plate, In 8-35 VDC, Out 5.1 VDC, 20 Amp, CageClamp Terminals	Call for Pricing
42560-287-05	B2 Plate, In 8-35 VDC, Out 5.1 VDC, 8 Amp, CageClamp Terminals	
42560-287-09	B2 Plate, In 8-35 VDC, Out 12 VDC, 4 Amp, CageClamp Terminals	
42560-287-10	B2 Plate, In 8-35 VDC, Out 12 VDC, 10 Amp, CageClamp Terminal	

Ordering Information - Hand Held Terminal

Ordering Number	Description	Price
31609-012-00	Rugged low powered hand held control display unit with 4-row by 16 charater display and RS232 interface used with CPU/PD and CPU II	Call for Pricing
54844-426-00	Panel mount bracket for holding Hand Held Terminal	

Ordering Information - Local Control Panel

Features

- Wide input power voltage range (9-33V DC)
- Key Switch to request local control mode with Local Control indicator
- Lamps ON/OFF and Lamp Test buttons
- 24 push buttons with 24 LED indicators, backlighting the push buttons
- Eight Non-Vital Outputs, relay contacts, 0.5 Amp DC or AC
- Eight Non-Vital Inputs, 9-18 VDC
- RS485 communications port

Ordering Number	Description	Price
42560-315-02	B5 Plate, 24 lighted pushbuttons, 8 non-vital inputs, 8 Form A Relay Outputs, and serial communication to CSEX Board	Call for Pricing

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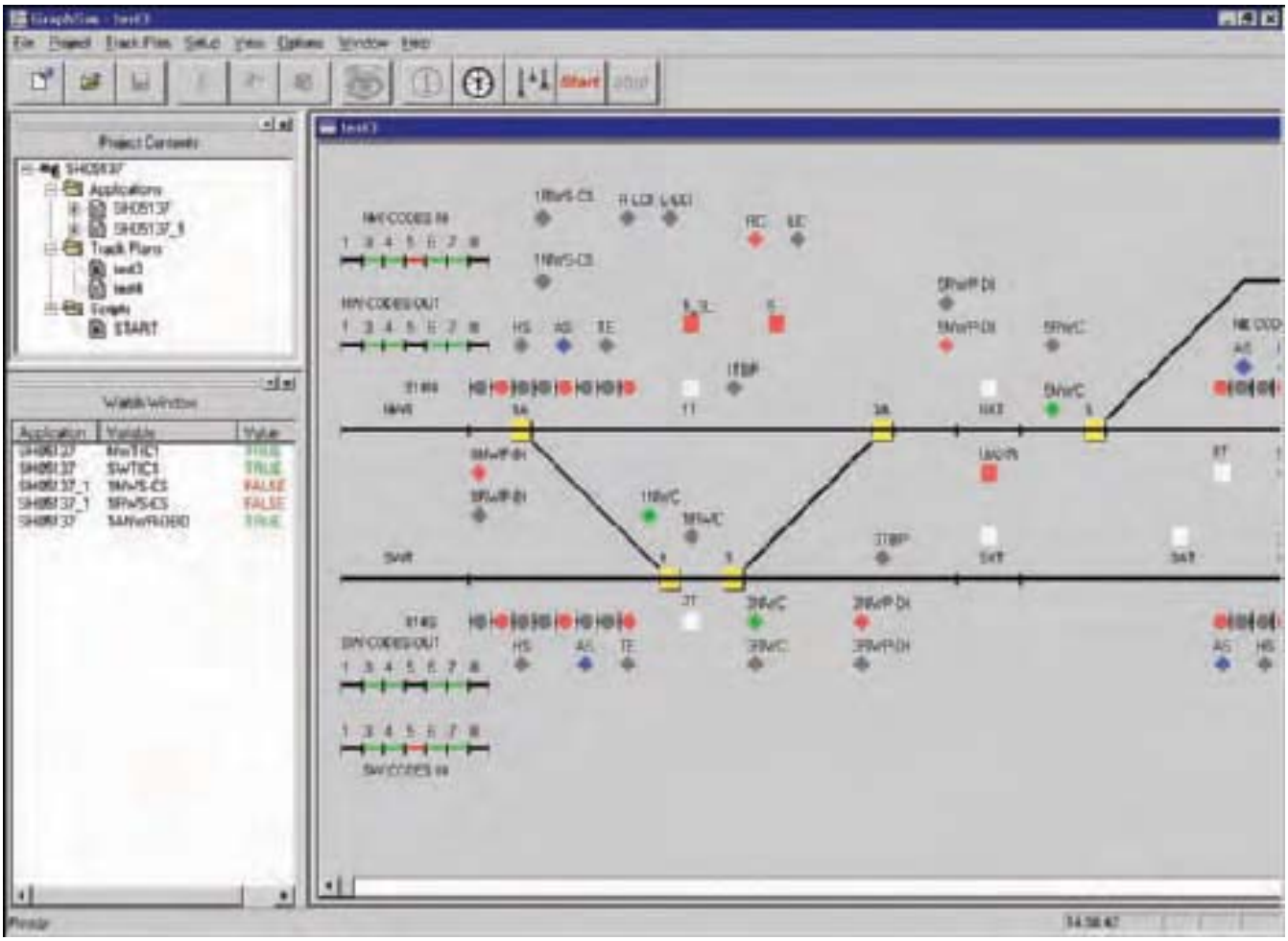
VPI® II Tools
CAAPE



The **VPI Computer-Aided Application Programming Environment (CAAPE)** is a comprehensive set of development tools for creating vital and non-vital applications. These tools are integrated together within a development environment for easy access and include graphical application building utilities, compilers for VPI vital and non-vital applications, vital Application Data Verifier (ADV) and Graphical Simulators. It provides for graphical hardware configuration, relay or ladder logic program definition and communication assignments. It also allows for the printing of the graphical relay circuits for final documentation. The build utilities include a library editor to create and maintain commonly used logic routines for easy reuse.

CAAPE includes an **Application Data Verifier (ADV)**, which is an inverse compiler that generates circuit check reports from application files illustrating hardware configurations and interlocking logic design as resident within memory devices to be installed in VPI field equipment. It produces documentation that tracks and highlights differences in an interlocking following changes to interlocking logic or configuration, thereby reducing the retest cycle.

The **Graphical Simulator** consists of tools to generate control and indication panels and simulators to exercise the vital and non-vital logic. The logic equations and variables can be viewed graphically with the corresponding states during simulation run-time. Multiple VPI systems can be simulated simultaneously.

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Features

CAAPE

- **Graphical or Textual Application Generation**
- **Integrated Application Design, Compiling, Simulation, Verification and Configuration Management**
- **Utilities for Printing Graphical Application Logic and Verifying File CRC's and Checksums**

ADV

- **Reconstructs Application Design from EPROM**
- **Generates Reports for Circuit Check**
- **Validates Configuration Management**
- **Helps Verify that Application PROM Data Matches the Intended User Input**
- **Reduces Field Test Time**

Graphical Simulator

- **Decrease Factory and Field Testing**
- **Simulate VPI Systems to Test Application Logic Without Hardware**
- **Simulate Multiple VPI Applications and Systems Simultaneously**
- **Use Track Plan Display to Simulate Operation of Field Devices**
- **View Status of Application Logic in Graphical Format, Set Breakpoints and Change-points to Stop Simulation at Specific Points in the Logic**
- **Monitor and Record the States of Selected Equations**

Specifications

System Requirements	List Price
PC Running Windows 95, 98, NT 4.0, SP2 or later, 2000, or XP	$7,500.00
200 MB Available Hard Drive Space	
64 MB of RAM Available	

Ordering Information

For assistance in ordering CAAPE for your system or for assistance in selecting and configuring a new system or addition, please contact the ALSTOM Customer Service Center at 800-717-4477

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VPI® II Tools
MMS

Features

- **On-Screen Control and Indication Panel is User Configurable for Small to Large Applications**
- **Graphical Diagnostics with VPI Module View decrease system downtime and ease maintenance**
- **Recording and Playback of all Time-Stamped Status, Diagnostic and Event data**
- **Works in Industrial, Personal or Laptop Computers**
- **Built in Configuration Management for VPI System Validation**

The **VPI Maintenance Management System (MMS)** provides a single graphical framework for total system exploration of VPI including full local control panel capabilities, diagnostics monitoring with online help, vital and nonvital application logic troubleshooting and testing and interlocking maintenance scheduling. MMS is a personal or laptop computer based user-friendly interactive program, which may be installed within an interlocking rack of equipment or kept portable. It integrates the functions provided by Watcher and Tracker. This supports field installation, test maintenance, preventative maintenance and condition monitoring of field devices. MMS can be configured as a single access point to multiple VPI systems.

MMS consists of the MMS editor and runtime programs. An MMS project is created using the MMS editor that imports application files from CAAPE.

Specifications

System Requirements	List Price
PC Running Windows NT 4.0, SP6 or later, 2000	$5,000.00
5 GB Available Hard Drive Space	
128 MB of RAM Available	

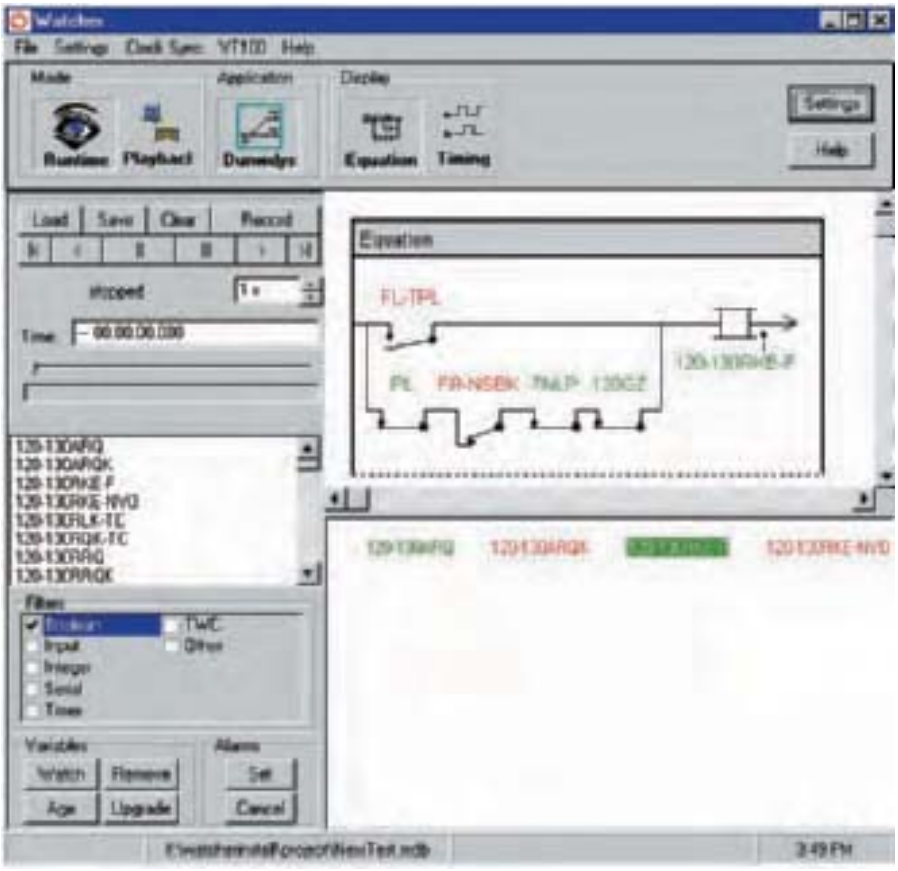
Ordering Information

For assistance in ordering the Maintenace Management System (MMS) for your system or for assistance in selecting and configuring a new system or addition, please contact the ALSTOM Customer Service Center at 800-717-4477

T.O.C.

Features

- **Easy to Set up - Decreases the Required Access Time in the Field**
- **Runtime View of Application Logic and Parameter States**
- **Monitor Record and Playback Multiple Parameters' States over Time**
- **Parameters are Displayed Using Their Assigned Names**



Watcher is a program for a personal or laptop computer that interfaces to an active VPI system to view vital and nonvital application variables' real-time status during factory, field or post installation activities. It can provide full-time or part-time parameter monitoring, reduces test time and facilitates field troubleshooting. Watcher is a troubleshooting, test and monitoring tool that provides a graphical representation of VPI logic in realtime. Multiple application variables and their corresponding states may be viewed as well as the text, relay or ladder logic statements. Watcher can record, store and play back the history of changes in the values of selected variables over time by using a timing stripchart view.

Specifications

System Requirements	List Price
PC Running Windows NT 4.0, SP6 or later, 2000	$3,000.00
500 MB Available Hard Drive Space	
256 MB of RAM Available	

Ordering Information

For assistance in ordering Watcher for your system or for assistance in selecting and configuring a new system or addition please contact the ALSTOM Customer Service Center at 800-717-4477

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Control Point in a Box (CPIB)

Features

- **Interface Cards Eliminate Complex Intra-Rack Wiring**

  Backplane Interface Cards are now available for the VPI Controller that dramatically reduce requirements for intra-rack wiring. These cards are inserted in the rear of the VPI Module in a series of card guides that mate with corresponding printed circuit board row-card edges.

- **Four-Track Circuit Support**

  A new Genrakode II motherboard and rugged chassis supporting up to four DC-coded track circuits are now available. Designed with specially formed sheet metal and fewer parts, the new chassis improves resistance to shock and vibration in demanding environments. The new chassis is compatible with the Genrakode II CPU board, which provides intelligent diagnostics, point-and click configuration, and a built-in Data Logger.

- **Vital Serial Link Improves Reliability**

  Communication between the GenrakodeII and VPI Modules is now handled through a new Vital Serial Link (VSL). In a 4-track configuration, the VSL can replace as many as six circuit boards, improving reliability and simplifying maintenance and troubleshooting.

- **Intelligent Local Control Panel**

  A new control panel, mounted on the CPIB rack, enables authorized local control of the interlocking. The local control panel interfaces with the Communication System Emulator eXtended (CSEX3) Board, reducing the need for dedicated I/O for local interlocking conrol. An illuminated pushbutton matrix supports up to 24 controls and indications. Eight nonvital inputs and outputs are available (option), further reducing the need for dedicated I/O. A visual display of the interlocking is provided in the upper right corner of the panel.

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Control Point in a Box (CPIB)

Now, you can easily order a complete ALSTOM Signaling control point—anything from a basic end of siding to a double crossover with turnout. Our pre-engineered Control-Point-In-A-Box (CPIB) solutions include microprocessor-based control systems for interlocking control, including pole-line and code-line elimination. Each solution improves resource utilization and productivity, while lowering operational costs.

Depending on your needs, your CPIB solution might be an individual module such as the VPI® Vital Processor Interlocking Controller, or a Genrakode™ Track Circuit and Communications Module. Or ALSTOM will combine these modules in a wired rack. We can even ship you a complete control point, including switch machines and signals.

Rack Components

- **VPI Vital Processor Interlocking Controller**
  Flexible, modular construction for maximum versatility; multiple modules combine for large mainline interlockings

  Reliable microprocessor based; independently verified by leading railways worldwide

  Extensive development tools included in CPIB CAA Package — easy to use compiler, editor, and graphical simulator in Windows®-based format

  Advanced diagnostics for reduced maintenance and testing—on-board LED indicators, hand-held terminal, and relay equivalent drawings

  New enhanced Data Logger allows usage of variable application names along with event-recorded data

  Field code emulation of non-vital information for code systems

- **Wayside Products**
  Switch Machines, relays, signals, transformers, rectifiers and much more

- **Genrakode II Track Circuit and Communications System**
  Intelligent diagnostics increase availability; new Genrakode II CPU board detects and isolates system failures

  Built-In Data Logger lowers maintenancecosts; integral data logging function stores up to 4,000 event messages and 4,000 error messages

  Windows-based software includes stand-alone tutorial, plus many graphic utilities to simplify the application process

  Five modules cover all signaling functions: Control Point, Intermediate, Repeater, Cab Signaling, and Switch Lock

  Rugged, new chassis and four-track capability improve reliability and increase flexibility

- **Intelligent Local Control Panel**
  Enables authorized local control of interlocking

  Optional I/O Expansion—8 Non-vital inputs and outputs

Ordering Information

For assistance in ordering and specifying a complete Control Point in A Box (CPIB) or for general assistance regarding ALSTOM's Interlocking Products please contact the ALSTOM Customer Service Center at 800-717-4477

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Centracode® II-s
Communications System

Features

- **Handles nearly 40 Protocols from older, DC types to net-working style protocols, with more being added**
- **Two hardware platforms provide optimum match with physical needs of existing equipment**
- **Extensibility as needed for system size and features**
- **Enhanced Datalogger provides integral event recording and on-line event time charts**
- **Configurable - Easily upgrade to new protocol as needed**
- **Both hardware platforms share common software development environment, common protocols, and common development environment**
- **Same system can handle requirements from highly standardized to highly customized**

The **Centracode® II-s** communication system, also referred to as a code system, performs two communication functions. The first function accepts parallel inputs supplied to the module from specific non-vital application equipment at a given track location, and serial input supplied to the module from other computer based systems in a specified protocol.

The second function of the module is to supply serial information outputs in the proper protocol to other computer-based systems, and parallel outputs to specific non-vital application equipment at a given track location. Both functions are performed through the use of a microprocessor and firmware located on the CPU board.

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System Hardware Description

General

The **CENTRACODE® II-s** communication system is available in two chassis styles: 3U and 9U. Both chassis consist of a mother board, CPU board, required I/O boards and 96-way connectors associated with the printed circuit boards. Each board has a keying strip with keying dependent on board slot location. This keying code prevents electrical damage to boards unintentionally inserted into the wrong slot. Slot 1 of the 3U and 9U chassis is always reserved for the CPU board.

3U Chassis

The 3U chassis is intended for the smaller applications. This chassis is 19 inches wide by 5 inches high and supports the horizontally-mounted CPU and I/O boards. A chassis with a full compliment of boards weighs about 8 pounds.

9U Chassis

The 9U chassis is intended for large system applications. This chassis is 19 inches wide by 16 inches high and supports up to 15 printed circuit boards (a CPU board and 14 I/O boards). The quantity of I/O boards used may vary dependent on the controls/indications at the location.

Mother Board

The mother board, attached to the chassis in connector location row A, carries information between the CPU and I/O boards. The mother board uses attached 96-way connectors to interface with the PC boards. Two styles of mother boards exist; one for the 3U chassis and another for the 9U chassis.

Optional I/O Expansion Boards

I/O Boards
96 Positive Input
96 Negative Input
48 Input/32 Output (+out) (-out)
48 Input/32 Output (Form C)
64 Relay Output (60 Form C, 4 Form A)

Diagnostic and User Interface

The CENTRACODE II-s communication system has a diagnostics program within the system software that assists the maintainer in troubleshooting a failure through the use of specific menus displayed on a properly configured terminal or PC. Menus allow the user to view what is displayed and select any one of the sub-menus or screens from the higher level menu. Screens are defined as displays where the user can only observe the screen contents. Anyone who uses the diagnostic screens should have access to both code charts and a CAA report printout of the .LCS file to understand the meaning of the data displayed.

A terminal or PC connected to the Maintenance ACcess (MAC) port on the CPU board, is needed for displaying the diagnostic menus, sub-menus, and screens. These menus access the operating system of the CENTRACODE II-s module and vary in use; some are used to report system status while others are used for manual control.

Ordering Information

For assistance in ordering or requesting further information on a Centracode® II-s System, please contact the ALSTOM Customer Service Center 800-717-4477

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CenTraCode® II-s
Hardware

Ordering Information - CenTraCode Processor

Features

- Emulates electronic or relay-based code system and also performs non-vital application functions and data logging.
- Typical functions include local control panel interface and N/X logic.
- Boards can be Hot Swapped without damage (not required to be powered off before removing or replacing the CPU or Input/Output boards).

Ordering Number	Description	Price
59473-976-51	CPU Board w/I/Os, 3 RS232 communication interfaces, 1-DC code interface, 24-Inputs, 16-Bipolar Outputs, supports hot-swap, Order EEPROM & RAM Chips Separately	Call for Pricing
01169-648-ON	System/Application EEPROMs (DIP 29F010 FLASH, 150ns or faster, 2/brd,)	
01169-592-ON	System/Application RAMs (DIP 88128, 150ns or faster, 2/brd)	

Ordering Information - Non-Vital Input/Output, Hot Swap

Ordering Number	Description	Price
59473-988-51	48IN / 32SINK, inputs (11.5-35 VDC), (-) outputs (10-35 VDC, 250 mA operation)	Call for Pricing
59473-988-52	48IN / 32SOURCE, inputs (11.5-35 VDC), (+) outputs (10-35 VDC, 250 mA operation)	
31166-018-51	48IN / 32RELAY, inputs (11.5-35 VDC), contacts (110 VDC/125 VAC, 30 Watt/62.5 VA, 32 Form C (Front/Heel/Back)	
31166-019-51	64RELAY, contacts (110 VDC/125 VAC, 30 Watt/62.5 VA, 60 Form C, 4 Form A (Front/Heel)	
31166-020-51	96 POS IN, 96 high-true inputs (11.5-35 VDC)	
31166-030-51	96 NEG IN, 96 low-true inputs (11.5-35 VDC)	

Ordering Information - CenTraCode II-s Chassis

Ordering Number	Description	Price
3U, Hot Swap		Call for Pricing
31038-260-02	3-slot w/CPU Board. Room for two additional boards	
9U, Hot Swap		
31038-261-02	15-slot w/CPU Board. Room for 14 additional boards)	

For assistance in ordering or requesting further information on a Centracode® II-s System, please contact the ALSTOM Customer Service Center 800-717-4477

VPI II
ALSTOM
ALSTOM Signaling is Proud to Introduce the NEW Standard for Interlocking Products
THE NEW VPI® II
We've Taken a Great Product and
Made it Better!
Performance, Maintainability and Safety
Updated Central Processor
Capacity for Larger Interlockings with Decreased Train Routing Latencies
Upgraded System Architecture
Industry Leading Flexibility in Interlocking Application and Partitioning, Utilizing State of the Art Networks
System Condition Monitoring
"Smart" Components Providing RealTime Operational Status Through Unique Test Tools Like MMS, Tracker, TestWrite, Watches...
Local or Centralized Graphical Maintenance System
Significantly Improves MeanTime to Restore Through Advanced Diagnostics. Streamlines Field Tests and Utilities for Extensive Site Data Management
LED Signal Drive
Call Our Customer Service Center at 1-800-717-4477 for Details/Demo
www.alstomsignalingsolutions.com

October 2005 Advertisement

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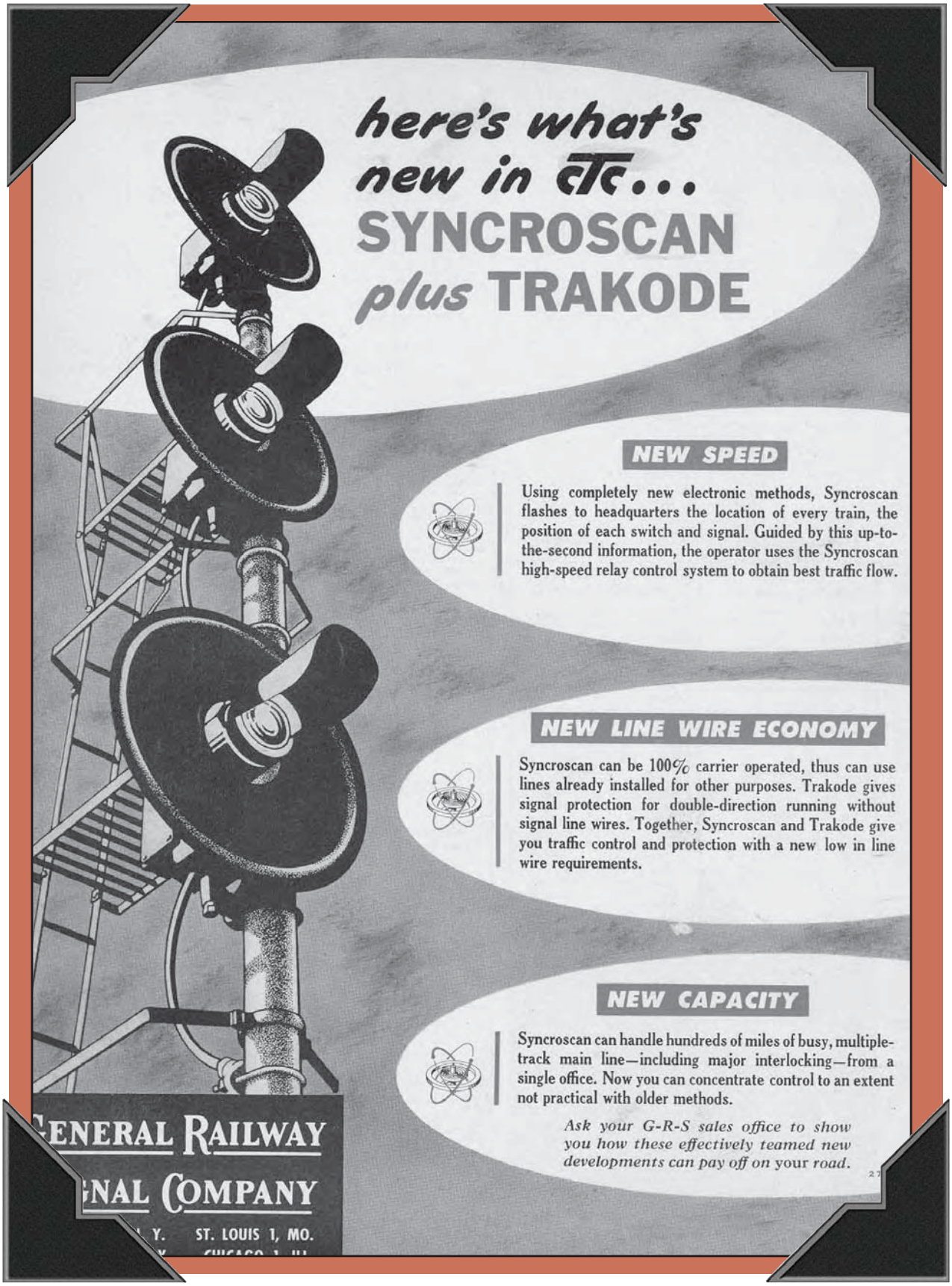
Looking Back


here's what's
new in GRS...
SYNCROSCAN
plus TRAKODE
NEW SPEED
Using completely new electronic methods, Syncroscan flashes to headquarters the location of every train, the position of each switch and signal. Guided by this up-to-the-second information, the operator uses the Syncroscan high-speed relay control system to obtain best traffic flow.
NEW LINE WIRE ECONOMY
Syncroscan can be 100% carrier operated, thus can use lines already installed for other purposes. Trakode gives signal protection for double-direction running without signal line wires. Together, Syncroscan and Trakode give you traffic control and protection with a new low in line wire requirements.
NEW CAPACITY
Syncroscan can handle hundreds of miles of busy, multiple-track main line—including major interlocking—from a single office. Now you can concentrate control to an extent not practical with older methods.
Ask your G-R-S sales office to show you how these effectively teamed new developments can pay off on your road.
ENERAL RAILWAY
NAL COMPANY
ST. LOUIS 1, MO.

1956 Railway Age Advertisement

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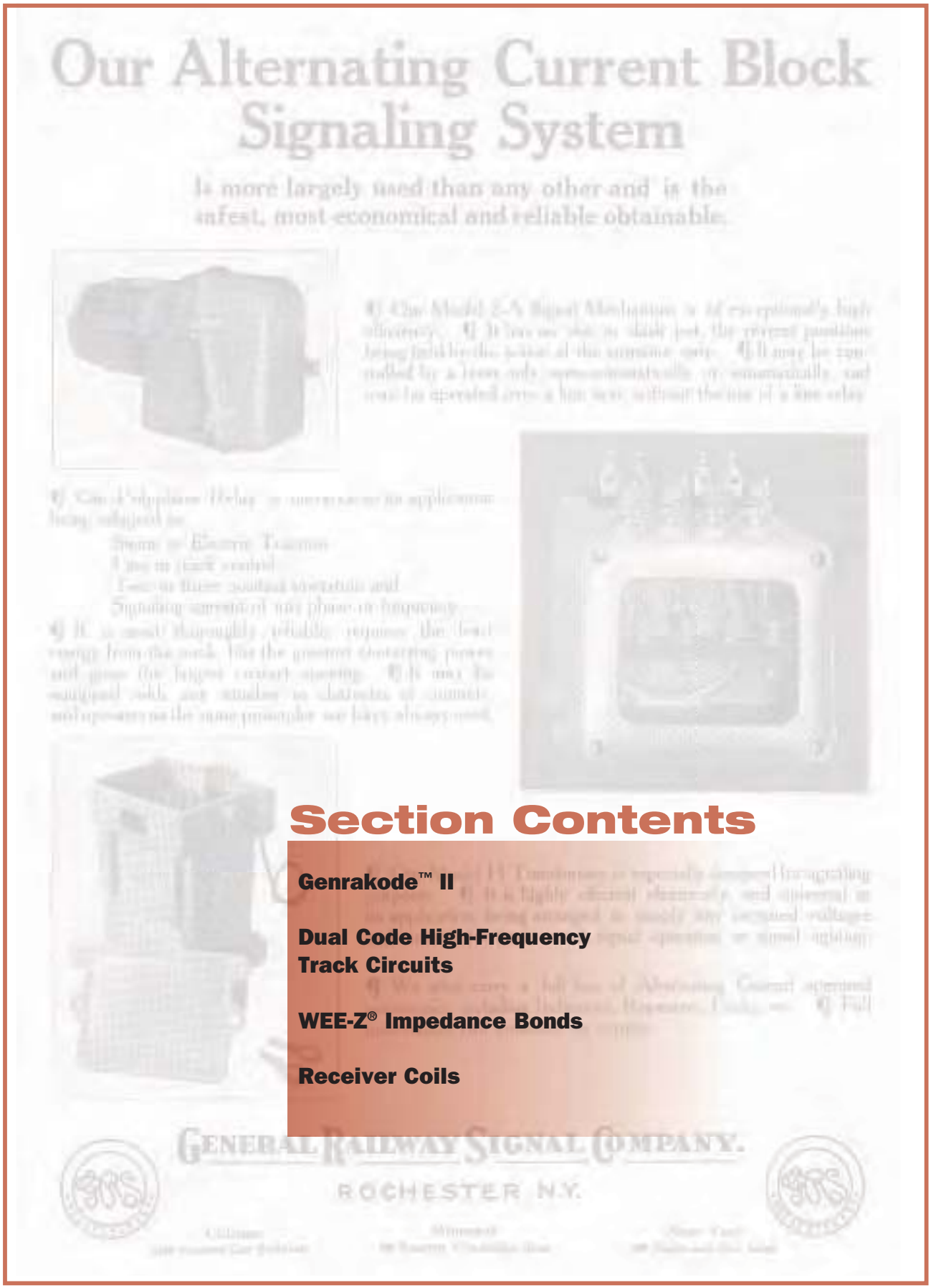
Our Alternating Current Block Signaling System
Is more largely used than any other and is the safest, most economical and reliable obtainable.
GENERAL RAILWAY SIGNAL COMPANY.
ROCHESTER N.Y.

Section Contents

Genrakode™ II

Dual Code High-Frequency Track Circuits

WEE-Z® Impedance Bonds

Receiver Coils

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Genrakode™ II
Track Circuit and Communication System

The latest generation of **Genrakode**™ adds new features to the reliability, maintainability and value for which the product has become known. First developed in 1989, the Genrakode Track Circuit and Communications System is a family of microprocessor-based modules used for vital signal clearing and train detection, non-vital block indication, and non-vital initiation of signal tumble-down. Genrakode is a DC-coded, bidirectional system fully compatible with Electrocode™ IV. The Genrakode II CPU board, with Intelligent Diagnostics, a built-in Data Logger and point & click configuration, makes the Genrakode system a truly exceptional value.

This microprocessor-based system for train detection and cab signaling is ideal for all rail applications.

The flexible, cost-effective system allows for eliminating pole lines and relays and adding signaling to dark territory.

Ordering Information

For assistance in ordering a Genrakode II system or Genrakode Code T, please go to the ALSTOM website for online configuration of Genrakode module ordering number http://www.alstomsignalingsolutions.com/genrakode2.html# or contact ALSTOM Customer Service Center at 800-717-4477

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Genrakode™ II
Track Circuit and Communication System

Features

Reliability
- **No safety notice in over 15 years of operation**
- **Mean Time Between Failure (MTBF) rating of 18.7 years**
- **Over 75 million hours in field operation**
- **Installed at over 35 customer properties around the world**
- **Safety Assurance Logic (SAL) for fail-safe operation**

Maintainability
- **No periodic testing of receiver modules**
- **Intelligent diagnostics**
- **New Code T provides advanced diagnostics**
- **Simple design that is easy to maintain**

Value
- **Huge cost savings by elimination of pole lines and relays**
- **Flexible design that is compatible with all major track circuits and interlockings**
- **Integrated data logger at no additional cost**
- **User programmable**

New Features

New Code 9
- New vital code, Code 9 provides additional vital signaling capabilities

New Code T
- New non-vital code, Code T provides up to eight individual indications from each location for advanced diagnostic and maintenance functions

Cab Signaling
- Three cab signal generators are available, each capable of driving the 5 standard cab signal rates: 75, 120, 180, 270, 420 PPM.
- Carrier frequencies of 60 Hz, 100Hz, and 250 Hz are available

Remote Operation
- Serial communications link at intermediate signal locations provides additional flexibility by permitting remote control of signals and codes

Enhanced CAA
- Enhanced Computer Aided Application (CAA) package. Includes editing and printing features that accelerate the application process

Ground Fault Detection
- Integrated within the Genrakode unit – no additional or external equipment needed
- Has a field adjustable detection threshold
- Is automatically cycle checked to verify proper operation
- When combined with Code T, can remotely report the status of proper operation and ground fault status

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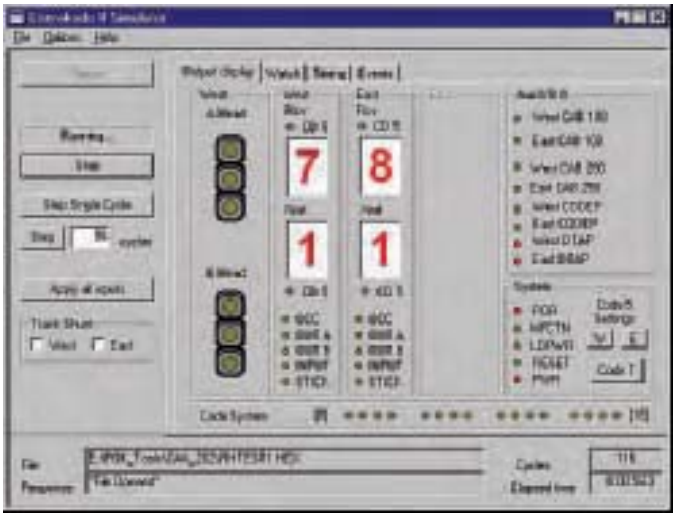
Genrakode™ II
Track Circuit and Communication System

Standard Features



User-Programmable

- User-programmable using a Windows™ based Computer Aided Application (CAA) package to provide rapid application development.

Intelligent Diagnostics – Increases Availability

- Intelligent diagnostics and built-in battery-backed data logger provides a time and date-stamped log of all external events as well as any internal fault.

Cable Integrity Check– Reduces Troubleshooting

- Cable integrity check provides additional security by detecting external cable failures.
- Real-time independent Code 5 selection for each track circuit allows for compatibility with adjacent coded track circuits.

Automatic Receiver Checking– Reduces Maintenance

- Automatic receiver level checking lowers maintenance costs by eliminating the requirement for manual periodic verification.

Regulated Lamp Drive Voltage Maximizes Signal Bulb Life

- The output voltage is regulated for both input voltage and lamp load current changes.
- Therefore, signal lamps can be operated at a constant lamp voltage.
- This increases lamp life and reduces signal maintenance requirements.

Isolated Logic Power Supply

- Improves lightning and noise immunity

Track to Line Board Simplifies Code Rerouting

- Track-to-Line board simplifies application when applying Genrakode in dark territory with existing DC crossing circuits.

Serial Communication Eliminates Relay Interfaces

- A serial communications link between Genrakode and VPI is available which reduces cost by eliminating relay interfaces and reducing the number of discrete wires required.

PC-Based Simulator

- A full featured PC based Simulator is available to assist in the development and evaluation of the application programming.

Easy to use configurator

- A PC based configuration tool simplifies ordering by automatically generating the appropriate ALSTOM part number.

Fail Safe Operation

- Safety Assurance Logic provides fail-safe operation. No safety bulletins have been issued for either system software or hardware components.

Long Track Circuit length

- Track circuits lengths of up to 29,000 feet are attainable (welded rail, 10 ohms DC ballast).

Solid State Construction

- 100% solid state construction reduces maintenance costs by eliminating relays.

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Intermediate Module

The Intermediate Module supports two track circuits and signals for both directions. It is used at intermediate signal locations to transmit and decode railborne line circuit information from adjacent modules and drive signals. Since the module drives lamps and mechanisms directly and performs all lightout detection, no relays are required.

The Intermediate Module can directly drive up to six individual color light signal aspects or up to two searchlight mechanisms in each direction. Outputs are continuously checked for correct state and all lamps are checked to insure that filaments are intact. Cable integrity checking is also provided.

Also featured are options which permit signals to be approach-lit or approach-lit only when AC power is lost. A dedicated input on the Auxiliary I/O Board may be used to approach-light the signal when AC power is lost, thus reducing the drain on the batteries. Auxiliary inputs are provided which allow the displayed aspect to be downgraded. These inputs are typically used for switch controllers, slide fences and other equipment.

Control Point Module

The Control Point Module supports up to two independent track circuits when interfacing with the interlocking relay logic at the location, via discreet inputs and outputs or up to an independent track circuit when interfacing directly to a VPI Interlocking Control System. It is used at end-of-block signal locations to initiate code transmission to other signal locations through the rails, decode signals from the rails, energize relay outputs reflecting the decoded line circuit information and optionally to generate cab signal rates.

Cab Signaling Module

Cab signaling is used in conjunction with the Control Point, Repeater, Switch Lock, and Intermediate Modules. The traditional 100Hz rate coded, or two-aspect ON/OFF cab signal system is implemented by overlaying the cab signaling onto the GENRAKODE track circuit.

Switch Lock Module

The Switch Lock Module supplies all functions necessary at a switch lock location including line circuit signal control, series track circuit lock release, siding timer release, switch lock magnet control and padlock contact direction.

Repeater Module

The Repeater Module is used at cut sections and repeats coded information in both directions.

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Genrakode™
Code T

The Revolutionary Railroad Communication System from ALSTOM
Expand your remote monitoring capabilities without expanding your budget with Genrakode and Genrakode Code T

Genrakode™ Code T provides an additional non-vital communications channel at no additional cost. Using the rails as the communications medium, non-vital communications can be received at the ends of the signaling block from all locations within the block. A unique location ID as well as a specific message identification allows the source of each message to be precisely pinpointed. By interlacing the non-vital messages with the existing vital train detection and vital signaling, remote monitoring eliminates the need for trenching cable or expensive radio communications systems.

Genrakode Code T potential uses include:
- Monitoring of grade crossing health
- Intrusion alarm reporting
- Signal filament status
- Status of commercial power

Benefits
Genrakode Code T applications can help simplify your maintenance activities, save you thousands of dollars and keep you in constant communication with your remote wayside locations.

Additional communication channel at no extra cost
By combining traditional train detection and vital communications through the rail with a binary coding scheme, Genrakode now provides a secondary communication channel that can be used for any non-vital signaling need.

Save cost by reducing the size of your battery system
Simply use Code T to monitor the status of the commercial AC power that keeps your batteries fully charged. As soon as power is lost, you can be notified giving you ample time to avoid failure due to discharged batteries.

Remotely monitor the status of your grade crossing equipment
Use Code T to extract critical health information that can be reported back to a central location or dispatching office.

Self Diagnostic Tool

Ordering Information

For assistance in ordering a Genrakode II system or Genrakode Code T, please go to the ALSTOM website for online configuration of Genrakode module ordering number or contact ALSTOM Customer Service Center at 800-717-4477

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CALL 800.717.4477 • FAX 585.274.8777

Genrakode™ Test Unit

Features

- **Rugged design – housed in a protective case and operates from -20° to +70° Celsius**
- **Portable – lightweight and easy to transport**
- **Easy to use – user-friendly, intuitive console**
- **Wide power voltage range (9 to 16 VDC)**
- **RS-232 communications port for connection to terminal or computer**
- **Flash upgradability of software**
- **Configuration settings are stored in non-volatile memory**

The **Genrakode™ Test Unit** was engineered with three primary design goals in mind: portability, functionality, and upgradability.

The test unit is compatible with all existing Genrakode and Genrakode-compatible systems to date, including various competitors' products. The unit is capable of receiving DC track codes 1 through 9 and also features for possible future codes. AC codes 1 through 8, 28, 32, 42, 43, 48, and 72 are also supported.

The test unit features two simultaneously operating channels: East and West. While both channels are independent from each other, certain settings must remain the same between the two channels. Specifically, the AC/DC mode selection, the Code 5 type, and the DC Normal vs. Transit selection must be the same for both transmit and receive on both channels.

The right side of the control panel is essentially a mirror of the left side: Both sides feature a two digit 14-segment display and Code 5 LED that indicate the code currently being received, if any. Additionally, both sides contain a code select rotary switch, a Code T transmit enable switch, a Code 5/6 transmit switch, and a transmit enable switch.

The test unit also features over-voltage, current, and thermal protection. For example, accidental connection of the track leads to a 16 volt DC battery source will not damage the device. Connecting the power connection or track leads backwards (i.e. negative to positive and vice versa) will also not result in damage to the unit. While the device contains numerous such protections, the maximum voltage that may be applied to any part of the device without causing damage is 16 VDC.

Ordering Information

Description	Ordering Number	Price
Test Unit	20182-119-01	$ 3,000.00

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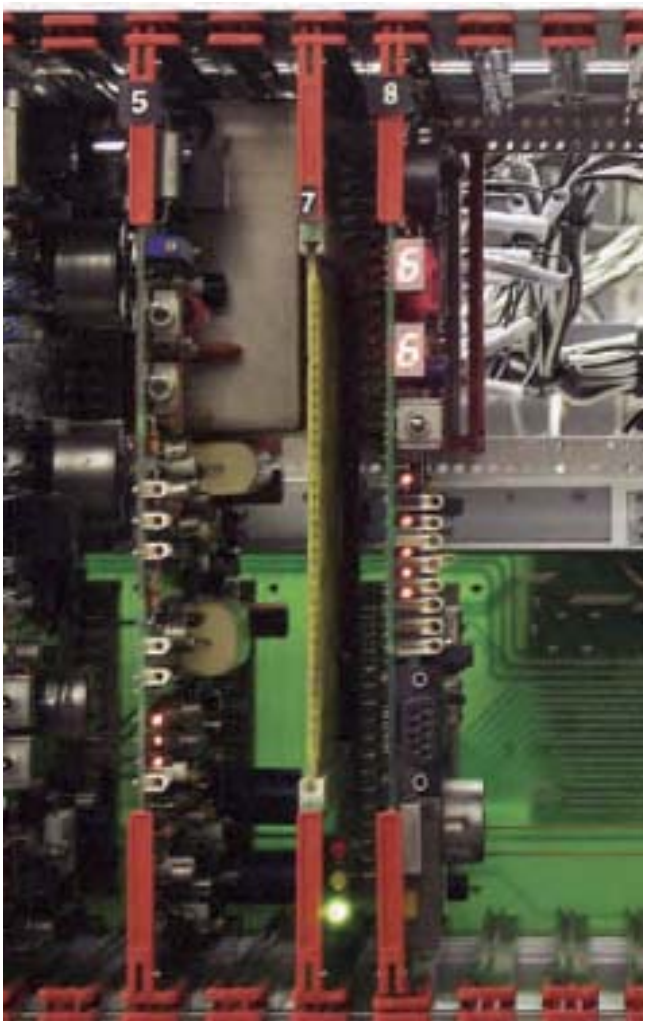
Dual Code High-Frequency
Track Circuit



Features

Immune to Electrical Noise

- **From chopper-controlled vehicles**
- **From foreign current interference**
- **Four frequencies/track for maximum security**

No Insulated Joints Required

- **Savings in track maintenance**
- **Ideal for welded rail**

Easy to Maintain

- **Solid-state electronic components**
- **Plug-in printed circuit boards**
- **Equipment for a number of circuits can be centrally housed**

High Capacity

- **For cab signaling and speed control or for automatic train operation**
- **Two-way data exchange between wayside and train**

The ALSTOM Signaling Inc. **Dual Code High-Frequency Track Circuit** reliably operates in the presence of electrical noise generated by chopper-controlled vehicles. The track circuit is ideally suited for use on continuous welded rail, where insulated joints are neither desired nor required. Combining solid-state devices with proven vital circuit relays, this track circuit eliminates the need for insulated joints, protects against interference from foreign current picked up in the rails, increases track circuit versatility, and provides a simple and proven method of transmitting function commands to the train for cab signals and speed control or for complete automatic operation. Track circuit lengths of up to 1,800 feet can be obtained, with suitable ballast conditions. A unique feature of the dual code high-frequency track circuit is the flexibility afforded by the "building block" concept. This allows the basic track circuit to be upgraded with more features added to accommodate stages of expanding facilities.

T.O.C.

CALL 800.717.4477 • FAX 585.274.8777

Dual Code High-Frequency
Track Circuit

The **Dual Dode High-Frequency Track Circuit** equipment consists of WEEZ® bonds, a solid state transmitter and receiver, and a track relay. With the exception of the WEE-Z bond, this equipment can be housed in a central equipment room or in a wayside case. The WEE-Z bond couples information between the rails and the electronic wayside equipment (via a single twisted-pair line circuit), defines block limits, and confines pertinent frequencies to the applicable track circuits. The transmitter and receiver consist of printed circuit boards which plug into a rack-mounted cabinet located near the associated track relays. The transmitter supplies, and the receiver responds to, the high-frequency signals in the rails, which provide track occupancy detection and automatic train protection commands. Up to eight frequencies are available for track occupancy detection. One or two additional frequencies can be used to transmit cab signal and/or speed control information, depending on the amount of information required. The WEE-Z bond traction current return can be connected to a traction return feeder, to a substation, or to a bond on an adjacent track. For more detail on WEE-Z bonds, see separate section on the bonds.

System Operation

Train Detection

The track is divided into blocks, with each block checked for occupancy by high-frequency track circuits. Except at interlockings, there are no insulated joints for block separation. The bonds also inject into the track speed commands that are picked up by the train. WEE-Z bonds are located at the ends of each track circuit, with one circuit usually in each block but two or more circuits in longer blocks. Except at interlockings, a particular bond serves as a track circuit boundary, the transmitter coupling for one circuit and the receiver coupling for the next downstream track circuit. An ATP transmitter at the leaving end of the track circuit feeds high-frequency energy to the track, using the WEE-Z bond as a coupling transformer. Acting as a receiver, a bond at the entering end of the circuit energizes a track relay if the signal from the transmitter is not shunted by the axles of a train. The transmitter and receiver associated with one particular track circuit are tuned to the same frequency.

Automatic Speed Commands

The high-frequency track circuit equipment is the communication channel between the wayside and train for the ATP speed limit commands. In addition, the WEE-Z bonds and rails are the transmission mediums for the train to wayside communications (TWC) system. The ATP speed command channel has a frequency separate from the train detection and TWC frequencies. When a train is detected in a circuit, a speed command generated by the wayside track transmitter at the leaving end of the circuit is transmitted through the rails to the train to control its speed.

Interlockings

At interlockings, special track circuits and insulated joints permit safe operation of opposing traffic moves. The system allows propulsion return currents to flow unimpeded through the rails, while blocking train and track signals and permitting cab signals to reach only the desired train.

Ordering Information

For assistance in ordering a Dual Code High-Frequency Track Circuit, please contact the ALSTOM Customer Service Center at 1-800-717-4477

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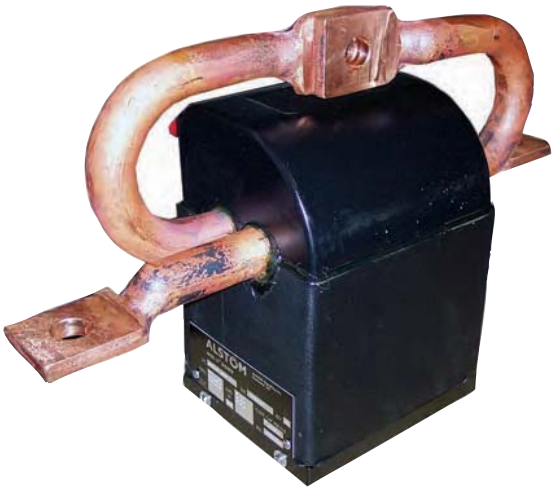
WEE-Z® Impedance Bonds



WEE-Z® Impedance Bonds are designed for rapid transit audio-frequency (AF) track circuits. They are used to terminate each end of an AF track circuit having different frequencies. The bonds are tuned to a respective frequency using capacitors mounted on circuitry inside the bond.

WEE-Z bonds provide a low resistance for equalizing the propulsion current in the rails.

The high capacity 4000 Amp/Rail bond is available for customers who operate long, high performance trains with short headways.

4000 Amp/Rail Bond

They are also used for:

- **Cross-bonding between tracks**
- **A connector for a negative return**
- **Coupling the track circuit transmitter and receiver to the rails**
- **Coupling cab signal energy to the rails**
- **Inhibiting the transmission of other frequencies along the rail**
- **Coupling bi-directional Train-to-Wayside Communication (TWC) through the rails**

WEE-Z bonds are configured for:

- **Short-range track circuits less than 1,000 feet (304.8m)**
- **Long-range track circuits up to 1,800 feet (548.6m)**
- **With or without Train-to-Wayside Communications**
- **Receive/Receive function only**

Compact One Piece Design

Ordering Information

Description	Ordering Number	Price
WEE-Z BOND COMPLETE	30859-008-XX	Call for Price
WEE-Z BOND COMPLETE	30859-009-XX	Call for Price
WEE-Z BOND COMPLETE	30859-010-XX	Call for Price

Note: For assistance in ordering WEE-Z Bonds for your specific application, please contact ALSTOM Customer Service Center at 800-717-4477

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Receiver Coils

Receiver coils are used for 100 Hz cab signaling systems – both continuous and coded. They are mounted underneath the front of the locomotive above the rails. The encapsulated coils inductively couple 100 Hz signals from the rails to the onboard vehicle signaling equipment. Integrated into the coil assembly is a test coil used to verify ATC operation during daily departure testing. During this testing the locomotive cannot be powered and the brake must be applied.

Ordering Information

Description	Ordering Number	Price
RECEIVER COIL COMPLETE - RH	52100-010-05	$ 1,795.00
RECEIVER COIL COMPLETE - LH	52100-010-06	$ 1,795.00

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GRS MOVES RAIL TRANSIT INTO THE FUTURE

Video display units at Central Control show the progress of each MARTA train.

Trains start and stop, automatically. Car-borne equipment exchanges traffic messages with the track and with wayside equipment. And GRS systems move rail transit into the future.

Recently, the Metropolitan Atlanta Rapid Transit Authority (MARTA) opened the first phase of its planned 53-mile rail rapid transit system. And MARTA chose General Railway Signal to automate the 6.7 miles of this phase.

MARTA chose GRS because of its demonstrated ability to satisfy competitive bidding requirements and proven capabilities in rail automation. Since 1904, GRS has designed and installed control systems in cities such as Washington, New York, Chicago, Boston, Cleveland, Toronto and now Atlanta.

GRS leads the way in innovation, design and manufacture of signaling control systems and equipment used for rail rapid transit. Our full-service capabilities include marketing, planning, research, engineering, production, installation and service.

Let GRS move your rail transit system into the future. For more information, call your GRS sales engineer. Or contact us and ask for Bulletins 200 and 212. General Railway Signal Co., Box 600, Rochester, N.Y. 14602.

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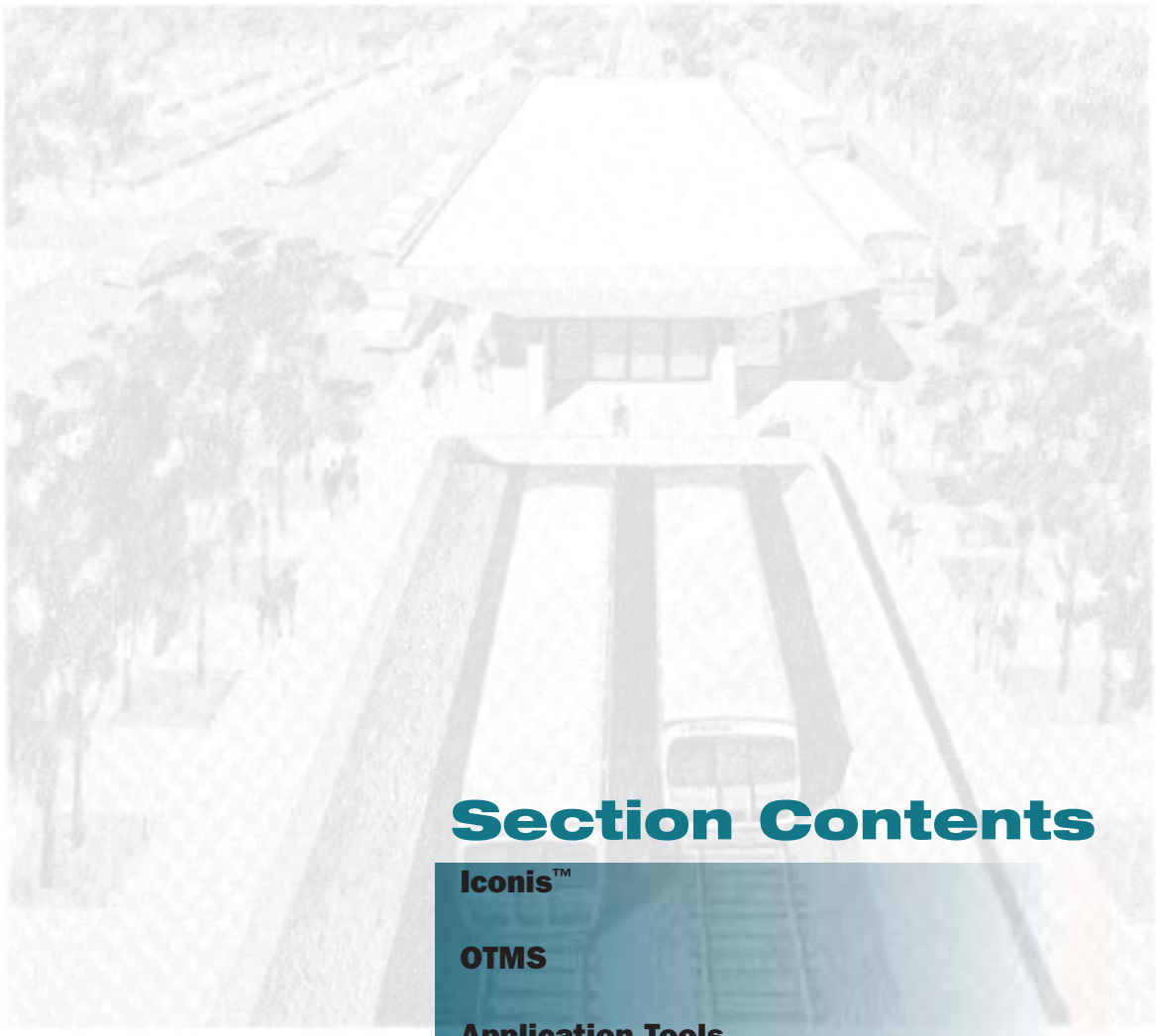

Section Contents

Iconis™

OTMS

Application Tools

TMS

ACSES

Micro Cabmatic™ III

ATC

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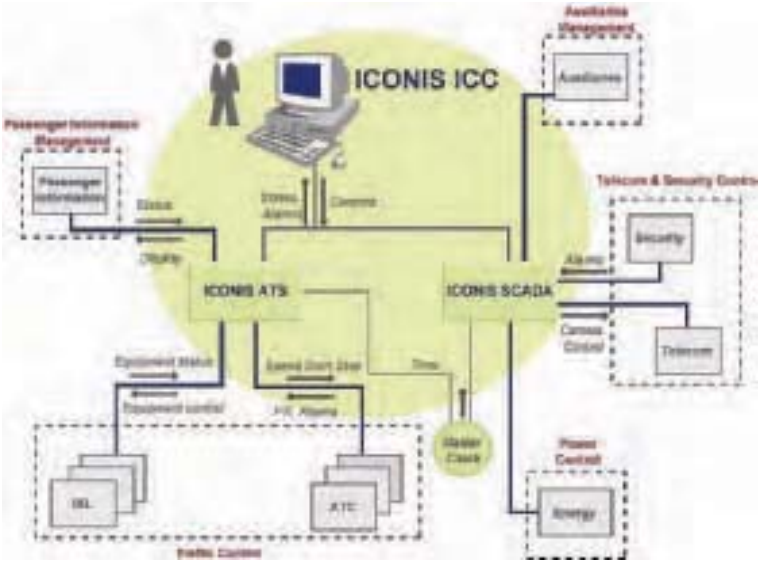
ICONIS™
Centralized Traffic Control
Advanced Solution for Railroad, Railway and Mass Transit Applications



Features

- **Improved efficiency, lower cost and productivity**
- **Modular system easy to customize**
- **Faster scheduling**
- **Maximize resources**
- **User-friendly interface**
- **Wide range of traffic control and management functions**
- **Priority management of operational events**
- **Optimize resources for train, track and manpower utilization**
- **Lower life cycle costs with proven, industry-standard**

ICONIS™ provides advanced supervisory solutions for train control requirements. Customized to match the requirements of individual applications, ICONIS addresses the needs of Mass Transit, Railways and Regional Mainline Railroad systems. ICONIS provides specialized modules for advanced scheduling functions, dark territory control, conflict detection/resolution, Time-Distance Graph, simulation, playback, and asset planning.

ICONIS design is based on PC architecture using the Windows™ operating system. This open architecture results in systems that are flexible, modular, and cost effective.

The modularity of ICONIS promotes distributed hardware control where any workstation may be used for supervisory control functions at any time. Operating over wide and local-area networks, railroads can distribute control functionality to improve resource utilization.

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ICONIS™
Centralized Traffic Control
Advanced Solution for Railroad, Railway and Mass Transit Applications

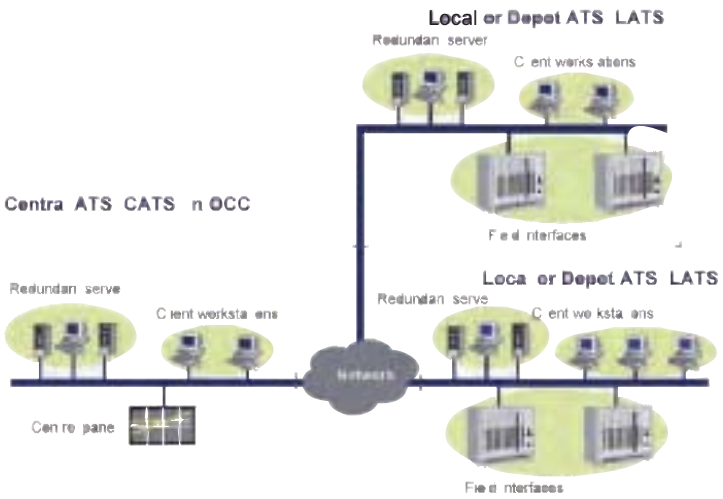
Features

ICONIS™ Control System
- Color graphic displays for train occupancy/train location, wayside equipment status and alarms/warnings
- Operation for mainline, local and interlocking control
- cTc or Dark Territory Operation
- High availability with Warm Standby auto - failure

Automatic Train Supervision
- Signaling supervision
- Route setting
- Train tracking and identification
- Timetable management
- Traffic regulation
- Driver information
- Conflict detection and solving

Traction and Energy Control Supervision and control of:
- Power supply network
- Traction sub-stations
- Third rail/catenary sections
- Energy equipment such as feeders, circuit breakers, switches, transformers, conductors, rectifiers, battery systems, no-breaks, etc.

Auxiliaries Management
- Supervision and control of equipment for traffic station infrastructures such as escalators, fans, pumps, lights, ventilation, fire detection, gates, etc.



Passenger Information
- Inform passengers with voice and visual message displays about train arrival, train destination, incidents, public address, etc.

Telecommunications and Security
- Systems Supervision and control over communication systems such as radio closed circuit television (CCTV), etc.

Resources Management
- Rolling stock management, crew availability and followup, passenger flow, statistical ticketing reports, data logging, etc.
- Commercial Relational Database
- System Interfaces For
  - Management Information Systems
  - Passenger Information Systems
  - AVI

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ICONIS™

Centralized Traffic Control

Advanced Solution for Railroad, Railway and Mass Transit Applications

Open Architecture

ICONIS™ relies on technologies facilitating the integration of existing software products.

ICONIS provides an open architecture by recurrent use of OPC communications. This PC-based solution enables the use of a large range of hardware and software modules for data acquisition. It also allows implementation of a large range of scalable systems, from single standalone station, up to a full wide-spread client-server configuration involving hundreds of PC's.

S2K, an ALSTOM product, provides the basic functions such as Human Machine Interface (HMI), alarm management, events database, data processing, etc.

ICONIS is based on the S2K infrastructure, associated with additional modules (built-in application components) and engineering tools to ease the implementation of complete systems.

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...anta begins rapid transit service with GRS automatic train controls

Metropolitan Atlanta Rapid Transit Authority -- MARTA -- chose General Railway Signal Company to automate the first section of its new system that began revenue operations this summer. GRS has installed and tested its transit automation system on 6.7 miles of double track, at 6 stations, and on the MARTA cars.

GRS is proud to add Atlanta to the roll of big city transit systems it serves: Boston, Chicago, Cleveland, New York, Toronto, and Washington. For information about GRS rapid transit control systems, write for Bulletins 200 and 209.

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GRS 75 YEARS

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ALSTOM

As freight railroads take on the challenge of building infrastructure to meet the burgeoning transportation needs of the global marketplace, ALSTOM steps up to the plate with train supervisory solutions that emphasize operational benefits of improved safety, added capacity and fuel conservation.

ALSTOM'S OTMS™ (Optimized Train Management System) not only delivers a "bigger picture" to help dispatchers make the most efficient and cost-effective decisions, it can also provide train crews with their own real-time "bigger picture" of their rail system.

OTMS™ provides a modular architecture that permits the addition of specialized functions for advanced scheduling, dark territory control, traffic planning and optimization plus many other applications: capabilities beyond traditionally offered dispatch systems. Through the use of computers operating on wide- or local-area networks, critical real time information is brought to the office and on-board instantaneously – from switch positions to work zones locations and movement authorities.

And like the speed of information it provides, OTMS™ payback is quick too. For example, a current ALSTOM customer applying OTMS™ over 6,000 miles of track, is projecting an increase in tonnage moved per unit of time with a breakeven in just 18 to 24 months. That makes the picture very clear.

ALSTOM is here to assist operators and owners with urban, intercity and freight rail systems. Let's talk about how we can serve you.

A global leader in power and rail infrastructure

www.transportation.alstom.com

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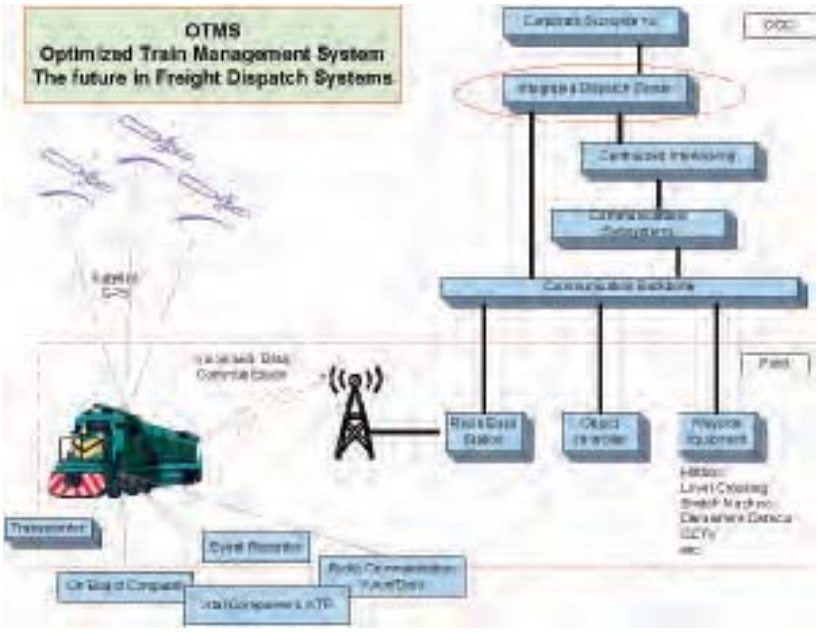
OTMS
OPTIMIZED TRAIN MANAGEMENT SYSTEM

Features

- **Improved Asset Velocity**
- **More Efficient Resource Utilization**
- **Increased Fuel Efficiency**
- **Automatic Train Dispatch**
- **On Board Computer Management**
- **Conflict Detection/Solving**
- **Train Movement Forecast**



Through the new **Optimized Train Management System (OTMS)** ALSTOM provides a comprehensive solution, which is backed by a genuine commitment to customer support. The solution provides overall Train Management System Functionality, including Signaling Equipment and Monitoring, an Integrated Communications Center (ICONIS), On-Board Computer Technology, Planning and Optimization Tools and Data Radio Communication equipment. There exists decades of evidence to indicate that ALSTOM has consistently provided top of the line Train Management solutions for the North America Railroad Market. ALSTOM's commitment to offering this comprehensive Optimized Train Management System is second to none. ALSTOM's introduction of communication systems into the new Optimized Train Management System (OTMS) is an innovative approach to an already advanced Train Management Solution. Communication between the Integrated Control Center and the On Board Computer provides an efficient, insightful look at on board operations in order to optimize train performance. Instantaneous communication and data flow will give the Integrated Control Center enhanced capabilities such as forecasting train movement and conflict detection/solving.

Ordering Information

For assistance in ordering and specification on the Optimized Train Management System, please contact the ALSTOM Customer Service Center at 800-717-4477

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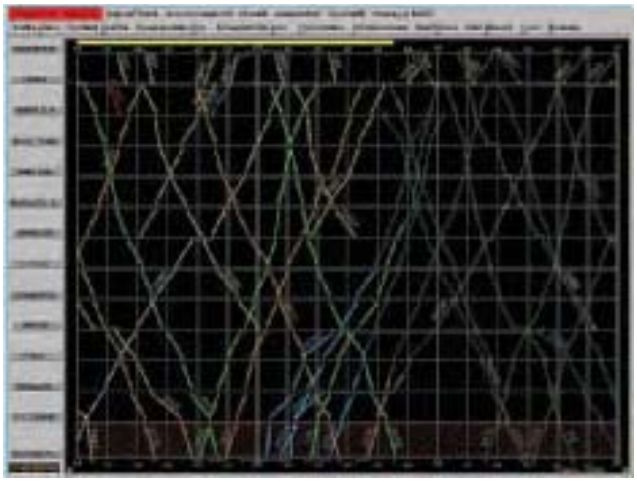
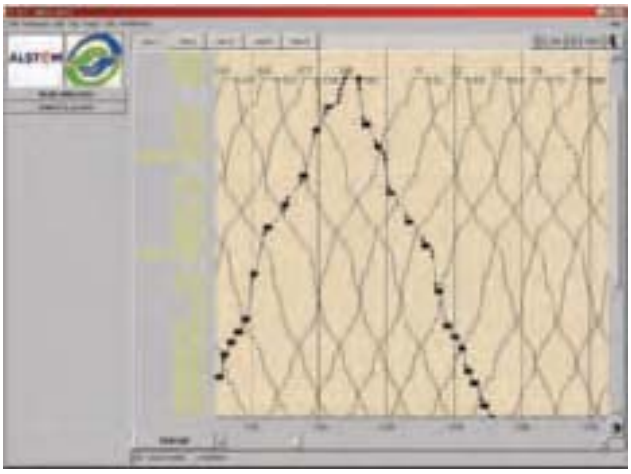
TDG
Time Distance Graph





Features

- **Train Representation in a space-time graph**
- **Infrastructure Provision Representation**
- **Abnormalities Representation**
- **Conflict Representation**
- **Modifications – all displayed objects can be modified**

Time Distance Graph (TDG) is a software product of ICONIS intended to help users monitor and regulate the train traffic circulation. Connected to the other functionalities of ICONIS ATS (eg: Timetable Management, Estimated Time of Arrival, Infrastructure Management, etc.), TDG gives a clear graphical view of the train circulation, infrastructure state, abnormalities and detected conflicts.

TDG can be used either in online mode or in offline mode, in order to plan in advance the train circulation taking into account the situation of the infrastructure or temporary modifications to the timetable.

TDG is easy to use and highly configurable. It allows the operator to see in advance problems on train circulation in a clear and intuitive way and then to act quickly to solve the problem.

The TDG displays trains in a space-time graph by lines. The line styles and colors depend on the train type and can be configured. By clicking on the train line, the stations crossed by the train are highlighted. Clicking on the station also provides detailed information about the train in the station. TDG displays infrastructure provisions and by clicking on them, a specific mask is recalled which gives information about the selected infrastructure.

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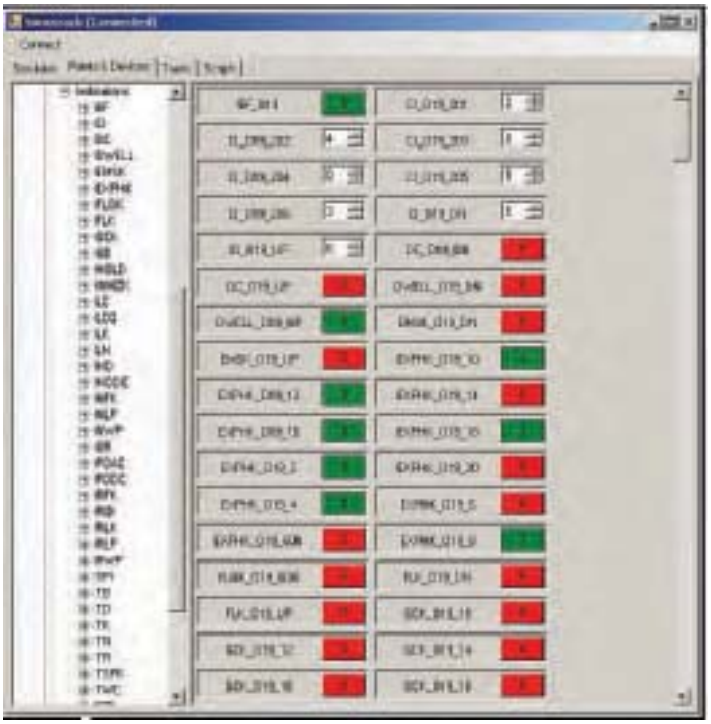
Features

- **Simulates the Interlocking Devices**
- **Simulates the Circulating Trains**
- **Simulates the Trackside ATC**



ALSTOM's **Simulation Tool** is a software product within the range of ICONIS products. It is a complete simulation system devoted to Mass Transit, Suburban Railways and Railroad applications. It is able to simulate the whole set of Interlocking Devices and the Train Control System (ATC). The Simulation Tool is used either in mode "switch box" in order to test the interfaces of the ATS or in a dynamic mode when the simulated devices react to the controls transmitted by the ATS. The Simulation Tool can also be used as a "training simulator" when it is associated with an ATS station.

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Train Movement Planner

Features

- **Displays predicted conflicts and their resolution in an easy-to-understand way using a Time Distance Graph**
- **Allows the Dispatcher to easily modify the plan by simple manipulation of the lines on the Time Distance Graph**
- **Allows the Dispatcher to set speed limits, work sections and other restrictions and do a what-if analysis to determine the best plan**
- **Interfaces with ICONIS, OTMS and the On-Board Performance Optimizer to close the loop and efficiently carry out the plan**

ALSTOM's ICONIS **Train Movement Planner** provides a comprehensive tool for Train Movement Planning and Dispatching. Optimal solutions are developed interactively involving optimization algorithms, computational agents and railroad personnel. A preferred, feasible solution is dynamically generated as a result of trade-offs among multiple user-prioritized objectives.

The Movement Planner runs in rail dispatch control centers, producing movement plans using Local Optimizers to solve conflicts, restrictions and resource constraints in real-time. Heavy Duty, Global Optimization procedures can also be run in higher time scales to produce optimized movement plans for longer planning horizons. Global Optimization looks for preferred solutions of scenarios in which objectives are selected based on transportation demands and management.

Alternatives such as different track maintenance schedules, train priorities and dispatch strategies are also evaluated in real-time using current operational state information. The Movement Planner provides for interactive "what if" evaluations of different scenarios, with no interface in the actual dispatch planning and operation.

The Movement Planner applies optimization algorithms to minimize train delays, fuel consumption, etc. but it is not just an optimization tool. It is a player in a multi-agent environment. The Movement Planner was carefully designed to amplify human intelligence, not to replace it. It aims to promote and enhance interaction and dialogue. It provides a common language, medium and intelligence to fulfil its purpose. Planning information and forecasts easily flow through operation areas, improving technical discussions and decision-making processes through the organziation.

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OBC
On-Board Performance Optimizer

Features

- **Real Time Performance Optimization of Trip Time**
- **Reduction of Fuel Consumption**
- **Reduced Wear and Tear on Components**
- **Rugged user interface**
- **Train events are uploaded to the Central Dispatch System for maintenance record**

ALSTOM's **On-Board Performance Optimizer (OBC)**, located in the locomotive cab, calculates the optimum speed and acceleration at any given instant for reduction of fuel consumption, optimization of arrival time (according to a defined strategy) and reduction of in-train forces. This results in reduction of wear-and-tear on couplers, knuckles, and other train components.

The OBC system utilizes:

- Real time status of signaling system, showing track occupancy for trains ahead and behind, and track profile
- GPS for current train position
- Grade and curve data of topology where the train is running
- Train profile (Locomotive and Car data, Gross and New Weight, in-train forces, etc)
- Current trip strategy

On-board equipment

- Ruggedized user interface to display the current train and track conditions
- QNX Operating System
- OBC gathers data from the central dispatch system and the train on-board equipment
- The maximum allowable speed from the train's ATC sub-system, the predicted speed for tracks ahead, and future conflicts are used to calculate the optimum speed and acceleration
- GPS antenna

Interface to ICONIS Dispatch System

- Wayside digital radio data communications can provide download of updated track profile, current signaling conditions and the trip strategy (to define the performance) that the Central Office Operator defined for each train
- Conflict detection and trip schedule validation is performed by the dispatch system
- Train events are uploaded to the Central Dispatch System for maintenance record

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TMS
Transportation Management System

Transportation Management Systems (TMS) are state of the art solutions to Train Control system requirements for both Transit and Mainline Rail Systems. The TMS design is based upon a network distributed architecture and applies industry standard approaches in both hardware and software. This open architecture results in systems that are flexible, modular and cost-effective. The TMS products apply Train Control application software design concepts that have been proven for over 40 years. ALSTOM's TMS features Redundancy, Automatic Failover and High System Availability.

The TMS evolved from Supervisory Control Systems beginning with single CPU minicomputers in the 1960's. TMS addresses the needs of both transit and mainline rail systems, with specialized modules for advance scheduling functions in transit and dark territory control in railroads. Through the use of flexible building block approaches and open systems software and hardware technology, TMS covers a broad range of both system size and capabilities. The building block approach and the distributed design also allow for easy system growth and functional expansion, as well as integration of MIS, AVI, and future communication based signaling information.

T.O.C.

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TMS
Transportation Management System

Features

Operations
- Centralized/Remote Train Control Management
- Increased Dispatcher Productivity
- Improved Efficiency via Automated Processing
- Faster Scheduling, Routing and Event Response
- Real-Time Alarm Notification
- Remote Diagnostics
- High System Availability

Open Systems
- Industry Standard Hardware Platforms
- Modular Scalable Software
- Distributed Client/Server Architecture
- Redundant Fail-Safe Processing Configuration
- Portable/Expandable/Upgradeable Components
- Transit or Mainline Railroad

Costs
- Lower Initial Investment
- Reduced Upgrade/Expansion Outlays
- Minimum Maintenance and Training Costs

TMS Capabilities

Train Control
- Control of Territory with Train Describer, Train Tracking, and enhanced Signal Control Function
- Automated Schedule Regulation, with Computer Aided Dispatching and Routing
- Display and/or Printing of Train Graphs
- Simulation and Playback
- Dark Territory Control
- Alarm Management
- Track Management via Blocking and MOW Authorities (DTC & TWC: GCOR, CROR, NORAC)

System Integration
- Communication Equipment
- Video, Voice Integration
- System Staging
- Project Management

Operations Reporting System
- Display Collected Operations Data
- Generate User Defined Reports
- Commercial Relational Database
- System Interfaces For
  - Management Information Systems
  - Passenger Information Systems
  - AVI

Ordering Information

For assistance in ordering a Transportation Management System, please contact ALSTOM Customer Service Center at 800-717-4477

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ACSES
Advanced Civil Speed Enforcement System

ALSTOM's **Advanced Civil Speed Enforcement System (ACSES)** is a proven Positive Train Control (PTC) platform. It is a continuous speed control system with intermittent transmission of data from transponders fixed on the track enhanced with a radio and communications system for dynamic updates of data. ACSES core functionality is based on ALSTOM's existing transponder based technology installed worldwide and operating in revenue service since the early 90s with over 5000 vehicles equipped, including high-speed trains (TGV). ALSTOM has installed ACSES on the Northeast Corridor (NEC), one of the busiest railroads in North America, allowing high-speed train travel up to 150 mph.

Modularity

- The technology is adaptable to meet the customer needs
- ACSES can be a cost-effective upgrade of signaled territories to include enforcement and is suitable for dark territories
- ACSES can be a vital overlay to a separate and independent cab signal system, success fully merging two railroad safety technologies or it can be a stand alone system
- ACSES can use passive "fixed data" or "switchable data" transponders
- ACSES can be implemented with or without a data radio system

Functions

- Speed enforcement for all train types including civil speed, Positive Train Stop (PTS) and Temporary Speed Restrictions (TSR).
- Temporary speed enforcement through data radio network.
- Enforcement of an absolute Stop (PTS) at Signals displaying a Stop Signal.
- Override of the PTS by radio if the signal status allows the train to go.
- Speed enforcement based on switch alignment by radio at interlockings and control points.
- The start and end of speed restrictions are precisely targeted.
- Onboard system calculates a speed-distance profile for both warning and enforcement.
- Auxiliary Functions: Tilt authorization, voltage and phase break supervision, etc.
- Enhanced grade crossing protection possibilities.
- Train and asset management possibilities.

Ordering Information

For assistance in ordering an ACSES system, please contact the ALSTOM Customer Service Center at 1-800-717-4477

T.O.C.

ACSES
Advanced Civil Speed Enforcement System

Maintenance Benefits
- Strong maintenance capability, utilizing the communications network, allowing maintenance information from the Onboard and the Wayside equipment to be provided directly to the maintainers stations
- Network management system to monitor state of communications network, radios and encoders
- All alarms and events stored in event recorder

Safety Benefits
- Protects from train to train collisions
- Protects from overspeed incidents
- Protect work zones and crews with Temporary Speed Restrictions

Subsystems

Transponder to Train Transmission Subsystem
- Location, speed control and auxiliary data sent to train at regular intervals along the track
- Simple, safe and accurate location determination system with no on-board track map required
- Passive transponders powered by the antenna located under an oncoming train
- Straightforward railroad and line changes
- Data from transponders stays available in case of radio unavailability

Vital On-Board Computer
- Acts upon the data received from the Transponders, Encoders and Safety TSR Server
- Determines precise location of train
- Builds and enforces maximum speed envelope
- Manages interfaces with ACSES Display Unit, Cab Signaling system and other vehicle equipment
- Manages other miscellaneous functions (ex: tilting authorization, voltage breaks, etc.)

Encoders
- Used where an interface to signaling logic is required
- Interfaces with signaling and safely encode and transmit to train signal status and route data

Communications System
- An Onboard to Wayside Radio system used to transmit TSR, Signaling, and Maintenance data to/from the train.
- Redundant Communications equipment at a central location to control message routing and delivery between equipment.
- ATCS radios and communications system used for the NEC application. ACSES application messages are self-protecting and ACSES can use different types of communication subsystems depending on the communications services required by each application.

Safety Server
- One Server safely managing all Temporary Speed Restriction data to/from train and to/from dispatchers.
- The Safety Server is a standard ALSTOM product designed for use in the rail industry than can be utilized for various vital server applications

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Micro Cabmatic™ III
Vital Microprocessor-Based Automatic Train Control System

Functions

ATP Subsystem
- Cab Signal Reception and Decoding
- Speed Sensing
- Overspeed Detection
- Digital Brake Assurance
- Zero Speed Detection
- Berthing Verification/Door Control
- Unintentional Movement Detection
- Rollback Detection
- Data Logging
- Aspect Display Unit
- Redundancy (To Provide Greater Availability)

ATO Subsystem
- Automatic Speed Regulation
- Programmed Station Stopping
- Data Logging
- Pre-Revenue ATC System Testing

ATS Subsystem
- Train to Wayside Communication (TWC)
- Wayside to Train Communication (WTC)
- Redundancy (To Provide Greater Availability)

Components

Vital B-Relays
- Interface the ATC System to the train
- Perform signal routing to vital circuitry
- Application of relays provides protection from any detected unsafe condition and results in a safe condition be requested

The **Micro Cabmatic™ III** system ATC module accommodates double-height Eurocards and is available in three standard sizes. All PC boards conform to Eurocard standards.

The Eurocard design provides high reliability, positive contact connections, and easy removal and replacement of boards. Each board has two Eurocard connectors.

T.O.C.

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Micro Cabmatic™ III
Vital Microprocessor-Based Automatic Train Control System

The Micro Cabmatic™ III Automatic Train Control (ATC) system is a modular product line encompassing functional hardware and firmware modules, which are combined to meet the operating requirements of a transit, commuter or railroad property. The ATC system employs solid-state microprocessor technology to provide for automatically controlling train movement, enforcing train safety, and directing train operations. The solid-state microprocessor based technology is a more versatile, reliable, economical, and compact system than the discrete component and mechanical based relay logic system it replaces.

The Micro Cabmatic system is designed around the popular Intel family of microprocessors and utilizes a special structure for expansion. The system hardware consists of Eurocard-standard PC boards.

The system is designed to operate in a fail-safe manner through applying Safety Assurance Logic® (SAL). SAL applies microprocessor technology to vital processes. It checks that the intended task is being performed correctly and assures that no output will be delivered if there is a possibility of error. The unique advantage of SAL is that it uses vital logic to provide an independent check to assure system safety without requiring redundant hardware.

Additional techniques have been added to SAL to provide vital processor system that is compatible with the application-dependent logic previously used in relay logic design. This evolved set of techniques is known as Numerically Integrated Safety Assurance Logic (NISAL).

The ALSTOM Signaling Carborne ATC system may consist of any combination of the following three subsystems. These subsystems are Automatic Train Protection (ATP), Automatic Train Operation (ATO) and Automatic Train Supervision (ATS).

The ATP subsystem is designed to provide the highest level of safety achievable within the limits imposed by available technology. The ATP subsystem provides vital control functions such as proper train separation and overspeed detection and assures that train doors are called to open automatically only at a station.

Functions normally performed by the train operator are provided by the ATO subsystem. These include smooth acceleration to the commanded running speed, regulation to maintain the commanded speed, and stopping the train smoothly at the proper position at station platforms and terminal zones.

The vehicle ATS subsystem is a two way communications link between the train and wayside. The ATS subsystem communicates with the wayside to select train routes automatically, dispatch trains automatically, provide train and crew reporting, and furnish the means to make trains responsive to supervisory commands (ex. schedule adherence) from Central Control.

Micro Cabmatic III equipment is configurable to operate on transit, commuter, and railroad systems. It has been proven on systems across the U.S. and abroad. The latest generation of this equipment is already being supplied in Washington, New York City, Atlanta, Taipei, Korea, and Shanghai.

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Micro Cabmatic™ III
Vital Microprocessor-Based Automatic Train Control System

Features

- **Easy to Install – Half the space of relay-based systems**
- **Reliable solid-state design**
- **More economical – Microprocessor-based**
- **Easily expandable – "Building block" approach**
- **Easier to maintain – Removable modules, Eurocard-standard PC boards, board-edge status LEDs, test points, diagnostic menus, and serial ports for diagnostic tool connections**
- **Available in custom configurations to meet any operating requirement, including unmanned operation, for transit, commuter or railroad environment**

Specifications

Data	Value
Operating Conditions	Temperature Range -40º C to +70º C Relative Humidity 0 to 95% Vibration 5-20 Hz, 0.070" p-p
Storage Conditions	Temperature Range -55º C to +85º C Relative Humidity 0 to 100% non-condensing Vibration 20-100 Hz, 1.4 g Mechanical Shock 4 g

Ordering Information

For assistance in ordering a Micro Cabmatic™ iii System, please contact ALSTOM Customer Service Center at 800-717-4477

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ATP Subsystem Printed Circuit Boards

ATP CPU Board

- Functions as central system processor, provides vital rate decoding and safe speed/overspeed verification
- All safety-related functions incorporate NISAL techniques
- Provides checkwords to keep vital power supplied to outputs
- Digital or analog speedometer drive with automatic calibration
- Watchdog timer
- Intel microprocessor-based
- 8 MB of Data Storage Flash (Data logging)
- Seven 16-bit counters and one 14-bit counter
- Four RS-485 serial ports for external interface; configurable for Train Computer, ADU, ATP, ATO, and ATS
- Real Time Clock
- Front Panel
  - Two alphanumeric displays
  - Two RS-232 serial ports for diagnostics, downloading logged data, and uploading program software
  - 16 status LEDs
  - 4 multi-function switches to access diagnostic menus

Vital Single Break Output Board

- 4 vital outputs per board
- Optically isolated from external interference
- Receives fail-safe source of energy from vital power controller
- Designed to detect absence of output current
  - Checkwords circulate through Absence of Current
  - Detector (AOCD) to determine presence or absence of output current
  - Checkwords return to CPU only if output current is not present
  - Checkwords reside in PROM on board (not externally generated)
- Specifications
  - Output voltage: VPC supply voltage
  - Output current: 0.75 A
  - Isolation between outputs: >3000 Vrms
  - AOCD current threshold: 3.0 mA

Vital Power Controller/Power Supply Board

- Provides fail-safe vital power to the vital single break outputs
- Receives checkwords from ATP CPU every 100 msec to provide or remove vital power
- Uses vital, isolated dc-dc converter to supply power to contacts
- Incorporates NISAL logic
- Intel Microprocessor-based
- Uses non-vital dc-dc converter to supply power to ATP PC boards
- Specifications
  - Regulated energy: 28 VDC @ 0.3 A
  - Unregulated energy: 35 VDC @ 1 A

Digital Brake Assurance Unit (DBAU) Board

- Uses two digital accelerometers to vitally measure train deceleration when brakes are applied
  - Senses both positive and negative acceleration
  - Accelerometer outputs read by ATP CPU, which determines brake rate of train
- Contains non-volatile memory to store calibration values for accelerometers
- Capable of sensing up to four different braking rates

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ATC
Automatic Train Control System Components

ATO/ATS Subsystem Printed Circuit Boards

Marker Detector/Power Supply Board

- Uses a two-coil antenna mounted to the bottom of the train to detect wayside markers to initiate and update programmed station stopping profiles
  - Digitally generates a composite signal consisting of the sum of all possible marker frequencies and outputs it to one coil
  - The presence of a wayside marker near the antenna couples its tuned frequency to the second coil
- Determines the frequency of the received wayside marker
- Interfaces with ATO/ATS CPU using RS-485 serial communication
- Uses non-vital dc-dc converter to supply power to ATO/ATS PC boards
- Performs self-diagnostic test to verify functionality of the board

P-Line Driver Board

- Controls train traction/brake system (Automatic mode only)
  - Sends signals through propulsion and braking train lines that determine the amount of traction or braking effort required
- Reads back the value of the propulsion current signal that was sent for diagnostic checks
- Contains 8 external 28 VDC inputs
- Transmits the train berthed signal to vehicle Alignment Antenna for reception by wayside
- Receives the active alignment markers during a programmed station stop
- Generates a test signal for diagnostic checks of the Alignment Antenna and Receiver

TWC Modem/Power Amplifier Board

- Transmits the Train to Wayside Communication message to TWC Transmit Antenna for reception by wayside
  - Amplifier on board amplifies the TWC signals from the TWC modem so the signals can be fed at proper levels to the TWC Transmit Antenna
  - Data is transmitted at a 110 baud rate in Frequency Shift Keyed format
  - Manchester encoding is used, which provides added data security in the EMI noise rail environment
- Receives the Wayside to Train Communication message from the wayside through the Receiver Coils

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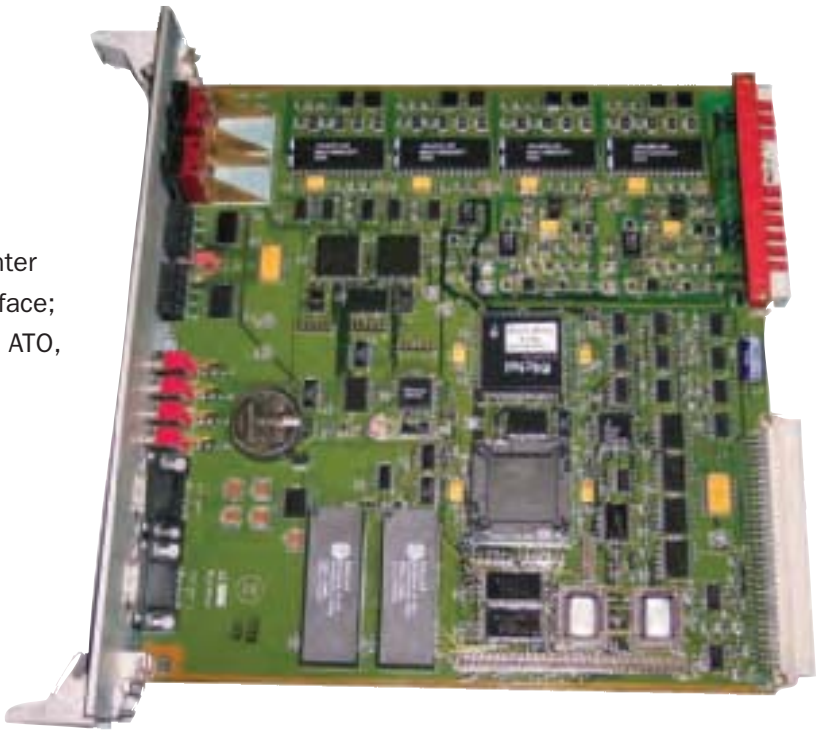
ATO/ATS Subsystem Printed Circuit Boards

Test Board

- Facilitates Pre-Revenue ATC System tests
- Contains the circuitry necessary to functionally test the Micro Cabmatic III system
  - Generates code rates used to test cab signal reception
  - Simulates speed sensor signals used to test overspeed detection
  - Simulates wayside markers, alignment markers, P-Line control to functionally test ATO system
- Remotely controlled from operator's cab
- Automatic or manual test sequencing

ATO/ATS CPU Board



- Central point of control for the various non-vital I/O functions of the Micro Cabmatic III system
  - Non-vital control of train berthing
  - Tractive effort calculations (speed regulation)
  - Programmed station stopping
  - Processing TWC
  - Pre-Revenue ATC System testing
  - Train computer communications
- Intel microprocessor-based
- 8 MB of Data Storage Flash (Data logging)
- Seven 16-bit counters and one 14-bit counter
- Four RS-485 serial ports for external interface; configurable for Train Computer, ADU, ATP, ATO, and ATS
- Real Time Clock
- Front Panel
  - Two alphanumeric displays
  - Two RS-232 serial ports for diagnostics, downloading logged data, and uploading program software
  - 16 status LEDs
  - 4 multi-function switches to access diagnostic menus

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ATC
Automatic Train Control System Components

ATP/TWC Receiver Coils

- Receives wayside ATP speed and door commands as well as wayside TWC messages sent through the running rails
  - ATP speed and door command signals sent to VCFD board
  - TWC message signal sent to TWC Modem/ PA board
- Integrated into the coil assembly is a test coil used to verify cab signal operation during diagnostic testing
- Mounted under the vehicle, ahead of the first axle of the lead cab

TWC Transmit Coil

- Transmits TWC information from the car via the running rails to the wayside
- Antenna is a 10-turn loop, which is housed in PVC pipe
- Mounted under the vehicle, ahead of the first axle of the lead cab

Speed Sensors

- The ATP and ATO subsystems use outputs from the speed sensors to determine:
  - Actual speed
  - Distance traveled
  - Direction

Peripheral Equipment

Marker Antenna

- Detects passive wayside markers, located between the running rails at fixed distances from the station platforms
  - Passive wayside markers initiate and provide distance to go' information for programmed station stopping
- Consists of two overlapping coils encapsulated into a single unit
  - Marker Detector board generates a composite signal of all marker frequencies which it sends into one coil in the antenna
  - The interaction of the composite signal coil and passive wayside marker when they are in close proximity to each other allows the wayside marker frequency to pass through to the second coil in the antenna
  - The received signal is sent to the Marker Detector board
- A nulling plate located on the antenna is used to adjust the coupling between the two coils

Aspect Display Unit (ADU)

- Console display device in the train operator's cab
- Interface between the ATC system and train operator
- Operates in real time
- Typical ATP subsystem displays include:
  - Current speed limit
  - Actual train speed
  - Overspeed warning indication/audible alarm
- Configurable for displaying non-ATP related displays and controls
  - ATO related information (station stop and skip stop indications)
  - ATS related information (train ID and route ID)

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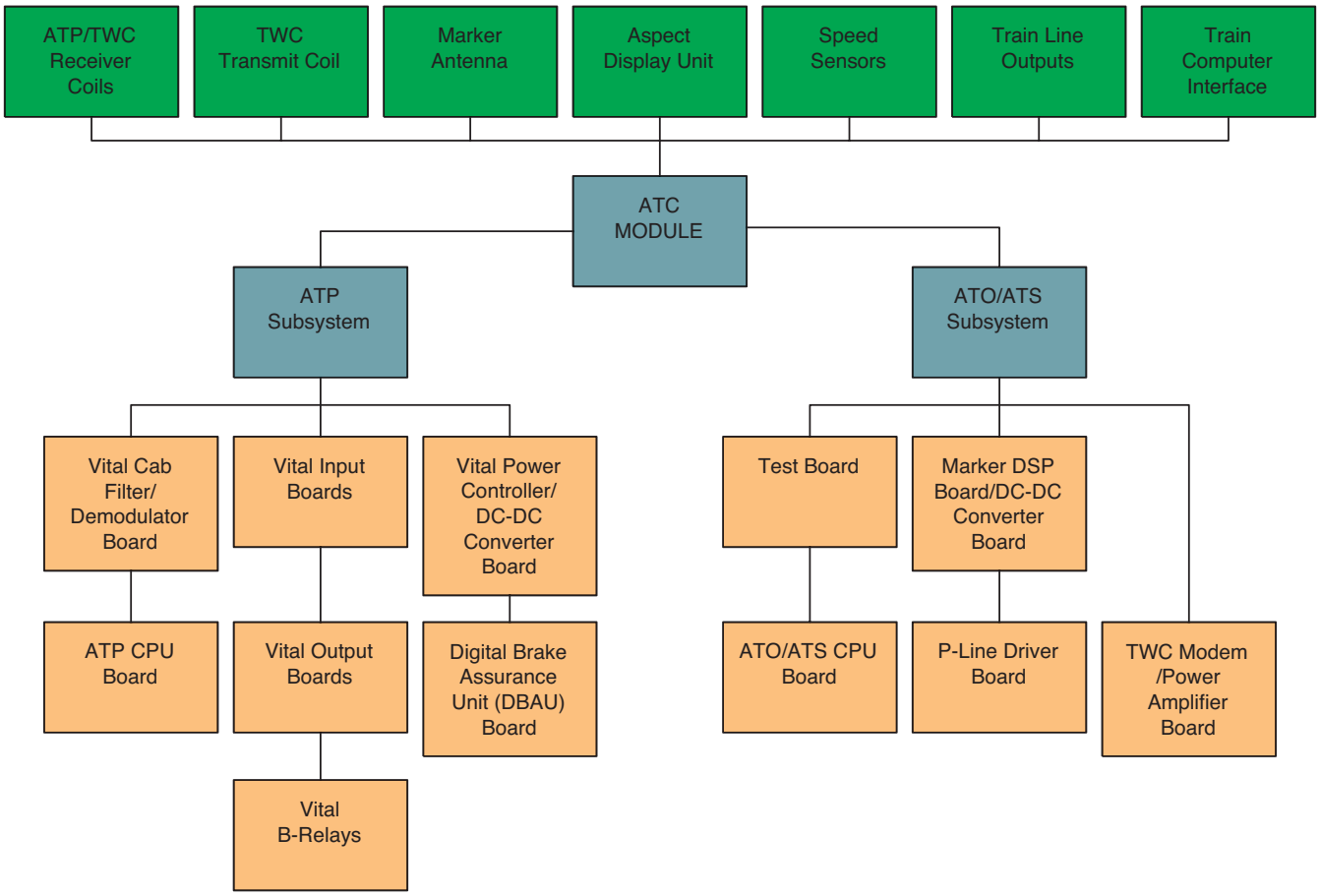
ATC
Automatic Train Control System Components



ATP Subsystem Printed Circuit Boards

Vital Cab Filter/Demodulator Board

- Vitally filters and demodulates signals received from cab signal receiver coils (demodulated square wave is decoded by ATP CPU board)
- Digital Signal Processor Technology
  - Two independent channels
  - Software configurable

Vital Input Board

- 8 vital inputs per board
- Optically isolated from external interference
- Checkwords circulate through inputs
  - Return to ATP CPU only if inputs are on
  - Checkwords reside in PROM on board (not externally generated)
- Specifications
  - Input voltage range: 17-40 VDC
  - Input current: 10-25 mA
  - Isolation between inputs: >3000 Vrms

Ordering Information

For assistance in ordering and specification on the Automatic Train Control System, please contact the ALSTOM Customer Service Center at 800-717-4477

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Looking Back

RAILWAY SIGNALING

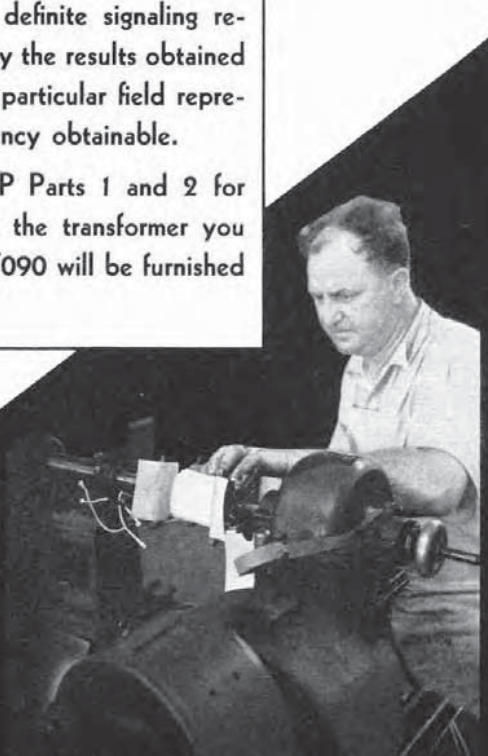
EXPERIENCE BUILDS G-R-S TRANSFORMERS

Over thirty years of constant improvement based on laboratory findings and actual field service has set up specifications for every G-R-S Signal Transformer. These specifications, requiring laboratory tested materials, and proven winding, assembling and impregnating procedure, are rigidly adhered to by experienced workmen.

Every G-R-S Transformer listed in our Wall Chart F090 has conformed to rigid specifications set up for a definite signaling requirement. That is why the results obtained from their use in their particular field represent the highest efficiency obtainable.

See Catalog Section P Parts 1 and 2 for ordering references of the transformer you require. Wall Chart F090 will be furnished on request.

Transformer taps clearly and permanently stamped on terminal board



GENERAL RAILWAY SIGNAL COMPANY

New York Chicago ROCHESTER, N. Y. St. Louis

A-1463

September 1938 Advertisement

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Types K1 and K2 Transformers

Type K1/2 Transformer

Types S1 and S2 Transformers

Type UT Universal Transformer

Rectifiers

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Transformers
Introduction

ALSTOM Signaling Inc.'s **Transformers**, designed expressly for use in railway signaling, are available in a wide range of sizes with capacities ranging from 4.5 to 1500 Volt-Amperes. Designed primarily for 60 Hz operation, ALSTOM transformers operate satisfactorily on line frequencies of 50 to 100 Hz with only a slight reduction of maximum available power.

Applications
- **Control panel lighting**
- **Signal lighting**
- **Battery charging**
- **Energy for AC track circuits and relays**

Rugged Construction
ALSTOM transformers are made with silicon steel lamina to ensure high operating efficiency. Windings are of Formvar or polyurethane insulated wire. Internal leads are securely fastened to AAR, Faston or screw terminals.

All ALSTOM transformers can withstand 3000 Volts AC between windings or from winding to core, except Type S2, which can withstand 1000 Volts between windings or from winding to core. ALSTOM pole-mounted transformers can withstand 10,000 Volts between windings or from windings to core.

Wide Selection
ALSTOM supplies lighting transformers small enough to mount inside a signal housing, line transformers with pole-mounting brackets, and battery charging and lighting transformers designed for wall, rack or shelf-mounting. Most types have primary and secondary taps to compensate for line voltage loss, provide for lamp dimming, etc.

Voltage Rating and Taps
Transformer primary and secondary voltage ratings and taps are listed in abbreviated forms. Here are their meanings:

- **115(100-15)**
  The full winding is rated at 115 Volts with taps at 100 and 15 Volts. The current rating for this winding is the maximum current that can be delivered at 115 Volts.

- **12(1-1-4-3-3)**
  The full winding is rated at 12 Volts with taps to provide any voltage from 1 to 12 in 1 Volt steps. The current rating is the maximum current that can be delivered at 12 Volts.

- **230/115**
  Two 115 Volt windings which can be connected on the terminal board either in series or in multiple to produce 230 or 115 Volts.

- **27.75[21(7-14)-6(1-3-2)-.75(.25-.5)]**
  The winding is wound in separate sections, parts of which may be connected in series to give a greater adjustment of terminal voltages than could be obtained from a continuous winding with the same number of terminal posts. Any voltage from 0.25 to 27.75 may be obtained in 0.25 Volt steps.

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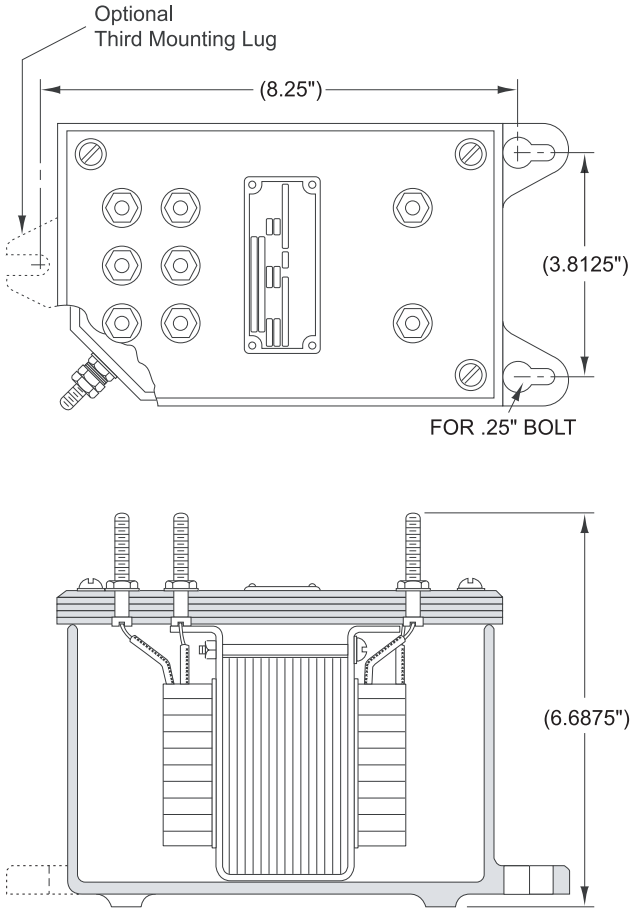
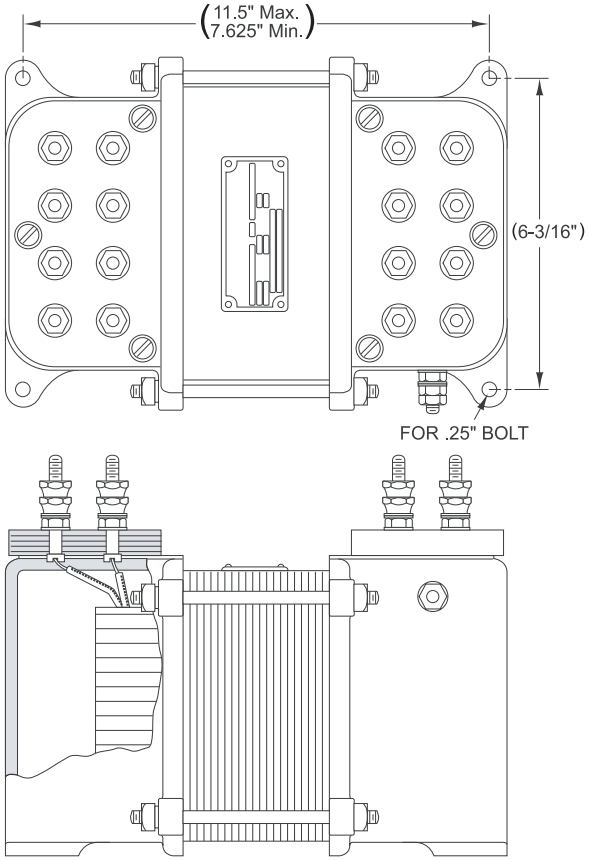
Types K1 and K2
Transformers



Type K1 Transformer



Type K2 Transformer

The **Type K1 Transformer** is ideal for battery charging, signal lighting, track circuits and other general uses. This transformer has a cast-steel case with two mounting lugs on one end. A third lug may be supplied on the opposite end if required.

The Type K2 Transformer also has a cast-steel case. The K2 Transformer is used to drop incoming power line voltage for operating relays and battery chargers.

Ordering Information - Type K1

Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps	Rated Freq. (Hz)	Ordering Number	Price
110-110 (55-55)	14(4-3-5-1-1)-14(4-3-5-1-1)	4.3-4.3	145	25	38270-100-05	$ 2,350.00

Ordering Information - Type K2

Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps at 60 Hz	Ordering Number	Price
110 (5-95-10)	40 (25-3-3-3-3-3)	18.75	750	38270-104-05	$ 2,750.00

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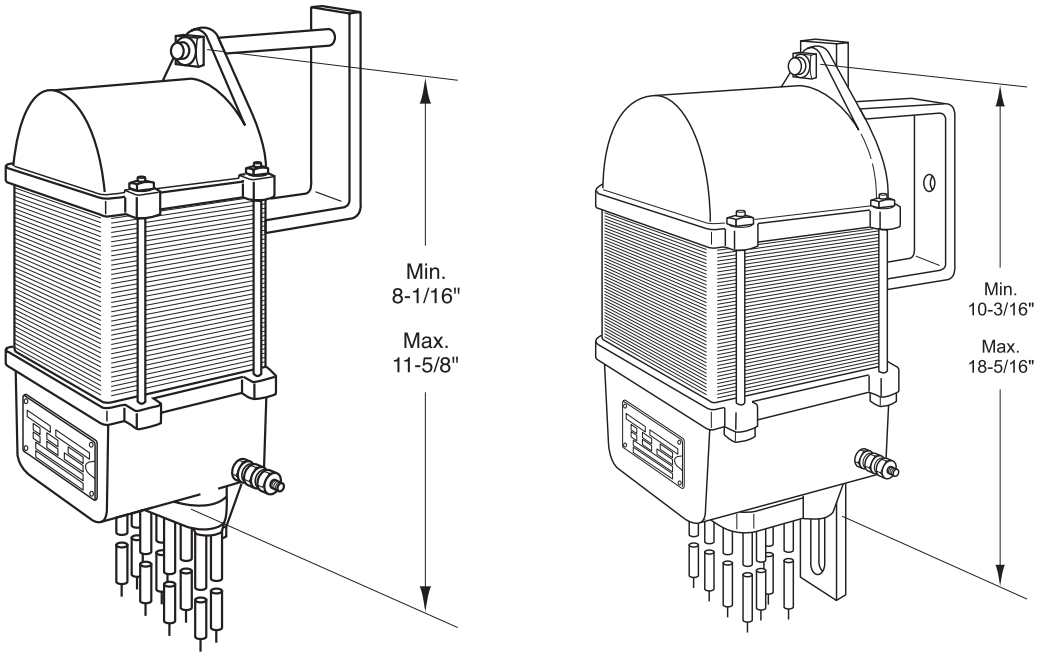
Types K1 and K2
Pole-Mounted Transformers



Type K1 and K2 Pole-Mounted Transformers provide 115V from a or 575V transmission line. Both feature weatherproof housings, 3-foot (91.44 cm) flexible leads and brackets for mounting on a crossarm.

Specifications - Type K1 Pole Mounted

Data	Value
Width	4-7/8"(12.38 cm)
Depth	4-3/16"(10.64 cm)
Height	Min. 9-1/16"(23.02 cm) Max. 12-5/8"(32.07 cm)

Specifications - Type K2 Pole Mounted

Data	Value
Width	6-15/16"(17.62 cm)
Depth	5-13/16"(14.76 cm)
Height	Min. 11-3/16"(28.42 cm) Max. 19-5/16"(49.05 cm)

Ordering Information - Type K1 Pole Mounted

Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps at 60 Hz	Ordering Number	Price
575 (28-490-57)	115	1.3	150	A95-0320	Call for price
575 (28-490-57)	115	2.61	300	A95-0325	$ 2,595.00

Ordering Information - Type K1 Pole Mounted

Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps at 60 Hz	Ordering Number	Price
575 (28-490-57)	115	6.52	750	A95-0385	$ 1,221.00
575 (28-490-57)	115	13.05	1500	A95-0386	$ 2,329.00

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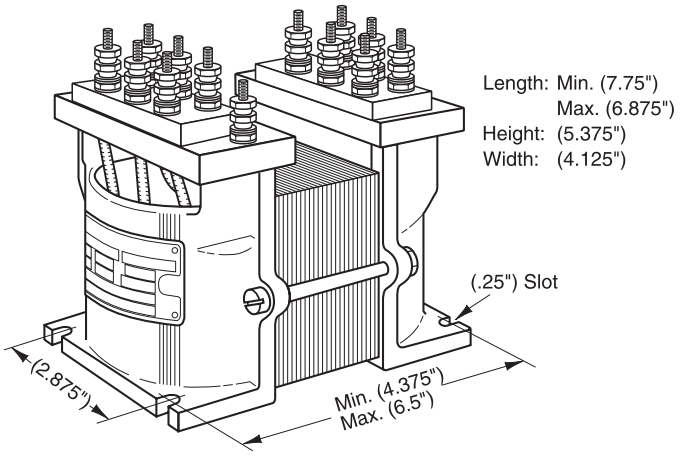
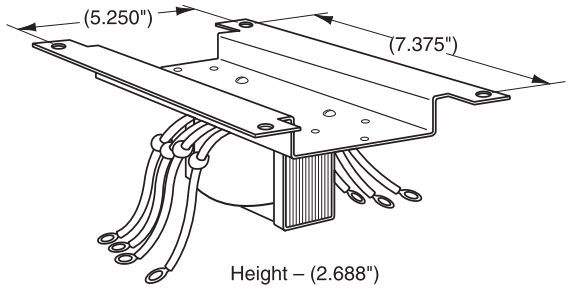
Type K 1/2
Transformer



A



B

Type K1/2 transformer is used primarily for signal lighting and panel lighting. Transformers Ref A. are used in wayside housings to supply relay signal, or code line energy. Transformers Ref B. mount inside a Model 6 switch machine case to operate dwarf signal lights or a switch position indicator.

Ordering Information - Type K1/2

Reference	Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps	Rated Freq. (Hz)	Ordering Number	Price
A	110 (6-92-12)	14 (2-2-9-1)	1.8	25	50/60	38270-018-01	$ 849.00
A	110 (6-92-12)	3 (2-1)-3 (2-1)	3.3	10	50/60	38270-018-02	$ 895.00
B	110 (100-10)	12 (1-1-4-3-3)	6.25	75	50	38270-025-06	$ 995.00
B	115 (5-100-10)	24 (2-18-4)	4.2	100	60	38270-025-02	$1,599.00
B	115 (5-100-10)	115 (5-100-10)	0.87	100	60	38270-025-03	$1,195.00
B	115 (5-100-10)	19.5 (.5-16-1-1-1)	1.28	25	60	38270-025-04	Call for Price
B	115 (100-15)	15[3(1-2)-12(4-8)]	6.67	100	50/100	38270-025-07	$1,400.00
B	115 (5-100-10)	18 (1-1-10-3-3)	5	90	60	38270-025-10	Call for Price

For assistance in ordering, please contact ALSTOM Customer Service Center at 800-717-4477

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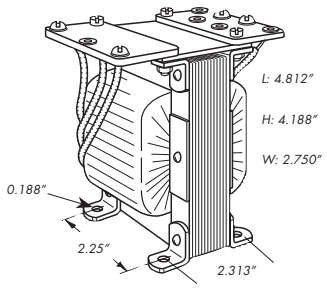
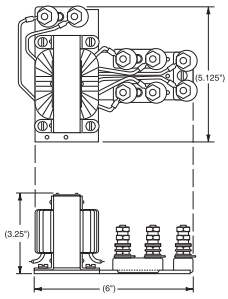
Type S1
Transformer

The compact **Type S1** Transformers fit into the housings of most signal units and switch machines. Applications for these transformers range from lighting signal and panel lamps to feeding clearance track circuits. Connections are made to No. .190"-32 screw terminals which are securely fastened to a board or AAR terminal posts.

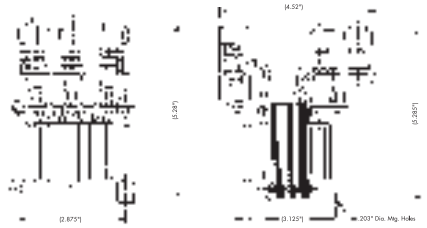


Ref. A

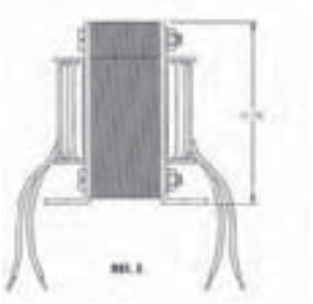


Ref. B

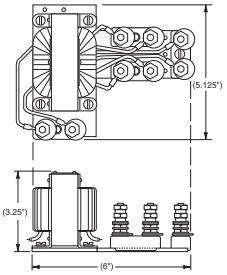
Ref. C



Ref. D



Ref. E



Ref. F

Ordering Information - Type S1

Reference	Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps	Rated Freq. (Hz)	Ordering Number	Price
A	115 (5-100-10)	12.5 (0.5-9-1-1-1)	4.8	60	60	53715-111-02	$1,199.00
A	115 (5-100-10)	12 (1-1-4-3-3)	5	60	60	53715-103-01	$1,299.00
B	110	12 (3-3-4-1-1)	3.3	40	60	53715-150-01	$ 499.00
C	110	220 (110-110)	0.09	20	60	53715-105-01	$ 799.00
D	120 (110-10)	23 (1-1-15-3-3)	0.6	14	25/60	53715-124-01	$ 799.00
E	120	10	6	60	60	53715-143-01	$ 399.00
F	110	12 (3-3-4-1-1)	3.3	40	60	53715-154-01	$ 729.00

For assistance in ordering, please contact ALSTOM Customer Service Center at 800-717-4477

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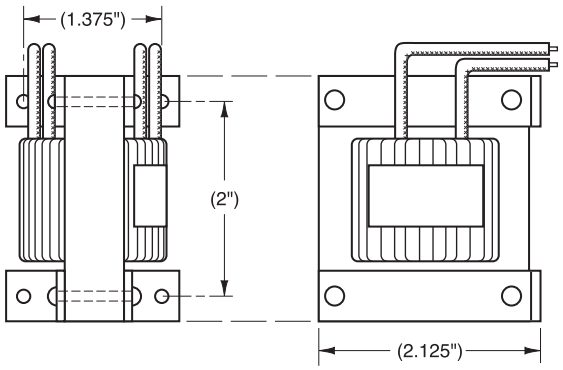
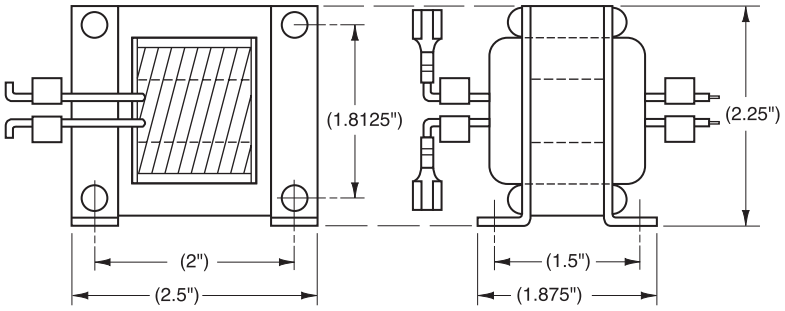
CALL 800.717.4477 • FAX 585.274.8777

Type S2
Transformer

The compact **Type S2** Transformers fit into the housings of most signal units and switch machines. Applications for these transformers range from lighting signal and panel lamps to feeding clearance track circuits. Connections are made to No. .190"-32 screw terminals which are securely fastened to a board or AAR terminal posts.





Ordering Information - Type S2

Reference	Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps	Ordering Number	Price
S2	110	20	0.38	7.5	53715-131-01	$ 299.00
S2	120	10	0.7	7	53715-144-01	$ 199.00

For assistance in ordering, please contact ALSTOM Customer Service Center at 800-717-4477

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Type UT Universal
Transformer

The **Type UT Transformer** meets virtually all of the low-voltage power requirements for railway signaling systems. The Type UT Transformer is ideal for handling the energy for signal lamps, AC track circuits, battery-charging rectifiers, control console panel lamps and cTc code lines.

The Type UT Transformer has two independent 120V, 60Hz primaries which may be connected either in parallel for a 120V input or in series for a 240V input. Each primary has 10, 20, 30 and 60V taps. The two independent 18V secondaries are each capable of delivering 11 amperes at 1 to 18V in 1 volt increments. The secondaries may be connected in parallel to deliver 22 amperes at 1 to 18V. Available current is 25% less when the transformer is fed from a 50 Hz source.

Each tap has two male terminals which connect quickly to 0.25 inch (0.64cm) Faston-type female terminals, included with the transformer. Terminals are recessed for protection. Numbers identifying the primary and secondary taps and interconnection lines are molded onto the terminal board for circuit reference. The unit's primary and secondary coils are encapsulated, providing excellent heat dissipation. Right-angle mounting brackets are adjustable, permitting weight-balanced support on the crossrails of a Type-B Relay Rack. This method of installation makes the terminals readily accessible on the wiring side of the rack. The brackets may be moved to the bottom of the case to accommodate backboard or shelfmounting.

Ordering Information - Type UT Universal

Primary Volts	Secondary Volts	Secondary Amperes	Total Volts/Amps at 60 Hz	Ordering Number	Price
120 (20-30-60-10)	18 (3-3-3-34-11)	11	396	31094-000-01	$1,299.00

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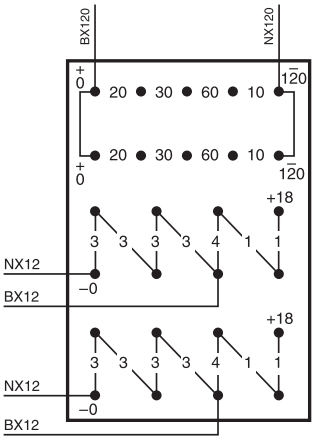
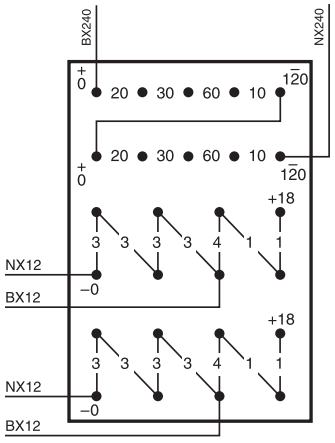
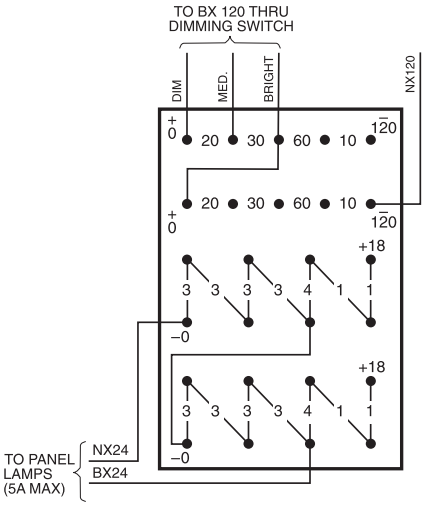
Applications



Two independent secondaries, 12V @ up to 11A each, can feed two AC track circuits or feed signal lamps, including the power transfer relay.

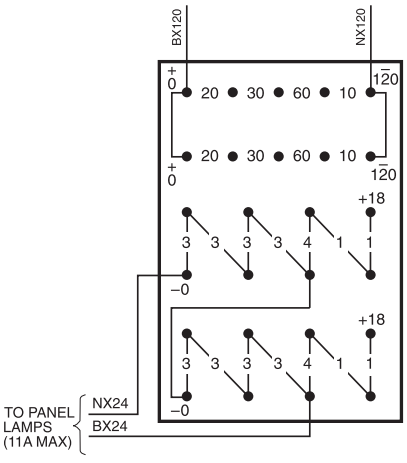


Same application as described left, except primaries are fed from 240V.

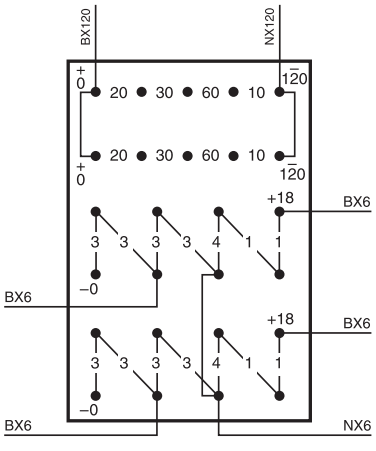


Control machine panel lamp fed from series-connected secondaries to provide 24V @5A.

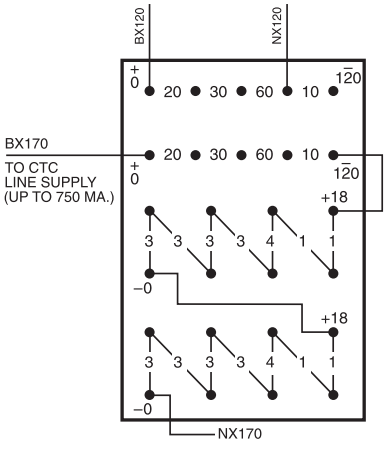
Dimming is done by switch selection of primary taps.



Primaries connected in parallel to provide 24V @ 11A for control machine panel lamps. Dimming is done by a variac.



Star-connected secondaries with single common. Supplies up to four 6V outputs @ 11A for control machine panel lamps. Dimming is done by a variac.



170V Output at up to 1.5A for feeding a cTc line supply.

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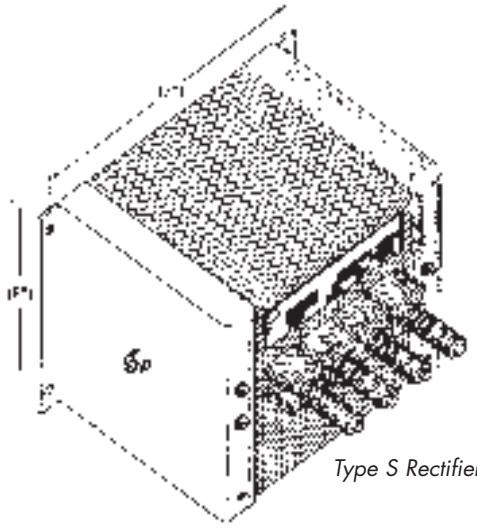
Type S
Rectifier Selenium



Type S Rectifier

The **Type S** Rectifier comprises a rectifying unit enclosed in a ventilated steel case.

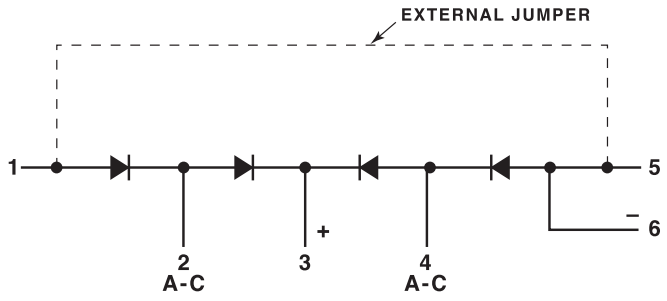
The Type S rectifier is for use with a separate transformer having a suitable secondary voltage to supply a load, such as DC relays, direct without battery. It can also be used for battery charging where a suitable low-voltage secondary is available on an existing transformer. A 0.4 ohm, 28 watt, adjustable resistor should be used for regulating the charge and to prevent undue overload of the rectifier after a power off situation.

Ordering Information - Type S Selenium Rectifier

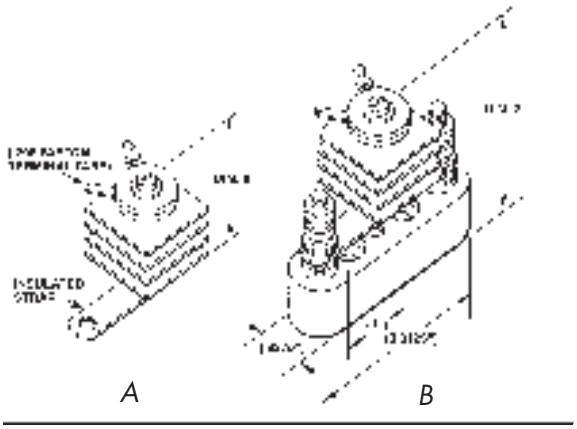
AC Input Volts	AC Input Hz	DC Output Volts	DC Output Amperes	Ordering Number	Price
35 Max.	Any	30 Max.	1.75	5899-004-02	$1,099.00

Type S, Size 1/4 Rectifier

These are small rectifiers for general use. They may be mounted on a terminal block or on an insulated strap.



Circuit



Ordering Information - Type S, Size 1/4, Selenium Rectifier

Reference	Maximum AC Volts	DC Volts	DC Amperes	Dimension "X"	Ordering Number	Price
A	35	25	0.3	2.4375 Inches (6.19 cm)	59899-005-03	$ 99.00
B	35	25	0.3	3.5 Inches (8.89 cm)	59899-005-06	$ 159.00

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Type SQ, SQA and S
Size 1/2 Rectifiers

The **Type SQ** Rectifier is a low-capacity rectifier with built-in transformer. It may be used to supply DC without storage battery standby. The Type SQ Rectifier may also be used to operate a DC relay on short AC track circuits in yards.

The Type SQA Rectifier is a low-capacity rectifier used for the operation of DC track relays in a single rail, AC track circuit with DC propulsion. The Type SQA Rectifier contains a transformer with a center-tapped primary winding.

The Type S Rectifier is a size 1/2, low-capacity, rectifier without a built-in transformer. It may be used in place of SQ and SQA Rectifiers when a transformer is not required.

Ordering Information - Type SQ Size 1/2 Rectifier

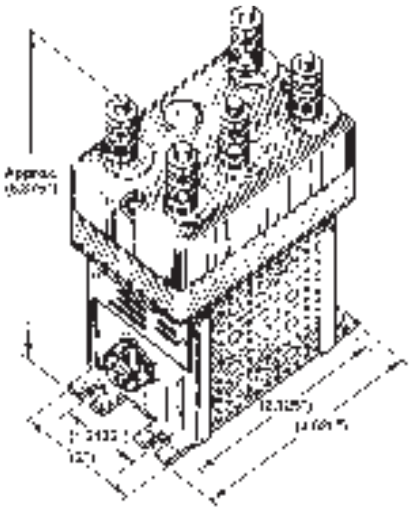
Reference	AC Input Volts	AC Input Hz	DC Output Volts (Max.)	DC Output Amperes	Ordering Number	Price
A	115	50/100	12.5	0.3	59847-002-01	$ 689.00
A1	115	50/100	25	0.2	59847-002-03	$ 599.00
A2	2	50/100	1.5	0.3	59847-002-07	$ 399.00
A3	2	50/100	5.0	0.2	59847-002-08	$ 495.00
A4	115	50/10	12.5	0.3	59847-002-04	$ 599.00

Ordering Information - Type SQA Size 1/2 Rectifier

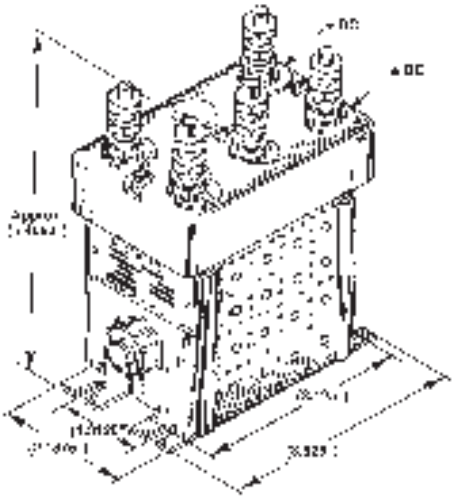
Reference	AC Input Volts	AC Input Hz	DC Output Volts (Max.)	DC Output Amperes	Ordering Number	Price
B	4	50/100	1.2	0.3	59847-004-01	$ 919.00

Ordering Information - Type SQA Size 1/2 Rectifier

Reference	AC Input Volts	AC Input Hz	DC Output Volts (Max.)	DC Output Amperes	Ordering Number	Price
C	35	50/100	10.0-25.0	0.3	59847-001-01	$ 389.00



Ref. A & B



Ref. C

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Type ST
Selenium Rectifier

Type ST Rectifier with S1Transformer

The **Type ST Selenium** Rectifier is comprised of a rectifying unit with an adjustable, reactive transformer. A micrometer screw is used to adjust the laminated yoke to provide gradual adjustment of the charging current from minimum to maximum rating.

The primary of the transformer has two coils. These may be supplied in series for use on a 230VAC supply, or connected in multiple, for use on a 115VAC supply.

Specifications

Data	Value
Width	4.125"(10.48 cm)
Depth	7.5"19.05 cm)
Height	9.437"(23.97 cm)
Mtg. Centers	(2 Holes) 6.25"(15.88 cm) X 8.813"(22.39 cm)

Ordering Information

AC Input Volts	AC Input Hz	DC Output Volts	DC Output Amperes	For Charging Lead Cells	For Charging NiCad Cells	Ordering Number	Price
230/115	50/60	3	2.5	1	2	A53-0525	$ 2,395.00
230/115	50/60	13.5-15.5	3.25-3	5-7	10-12	A53-0528	Call for price

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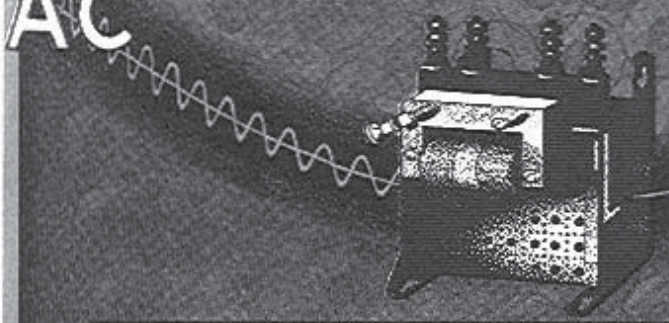

DC

for ANY APPLICATION

When d-c. electric power is required and only a-c. electrical power is available, some means of rectification must provide the transition.

Obviously, the most economical and desirable method is that wherein the total cost for the desired service is a minimum.

And don't forget,—the total cost means: the initial cost of the rectifier *complete with all the necessary appurtenances*, the fixed charges including amortization, and the cost of operation including maintenance.

The present ideal on such an unbiased and economically sound basis is the **G-R-S Full-wave Copper-oxide Rectifier,** of which there is a type for every requirement.

Since rectification is a silent and invisible electrical phenomenon in a compact, rugged, and permanent metallic structure, its installation in a relay housing in any position permitting proper ventilation is the first, last, and only consideration. From then on, a minimum power input is taken for a given power output regardless of the load characteristic and without attention.

See Bulletin 166 entitled **"G-R-S Copper-Oxide Rectifiers"** for ordering references or write our nearest district office for recommendations.

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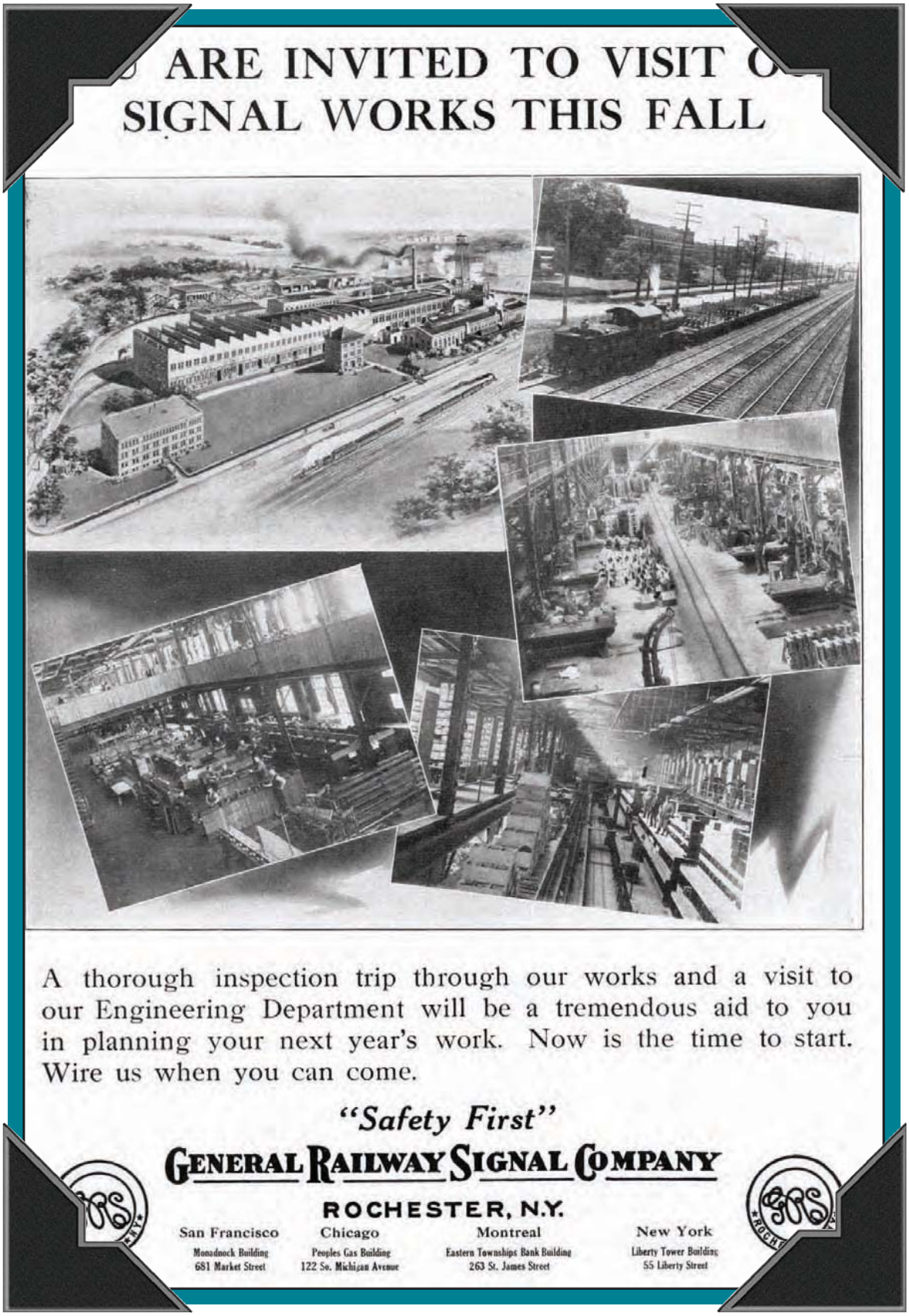
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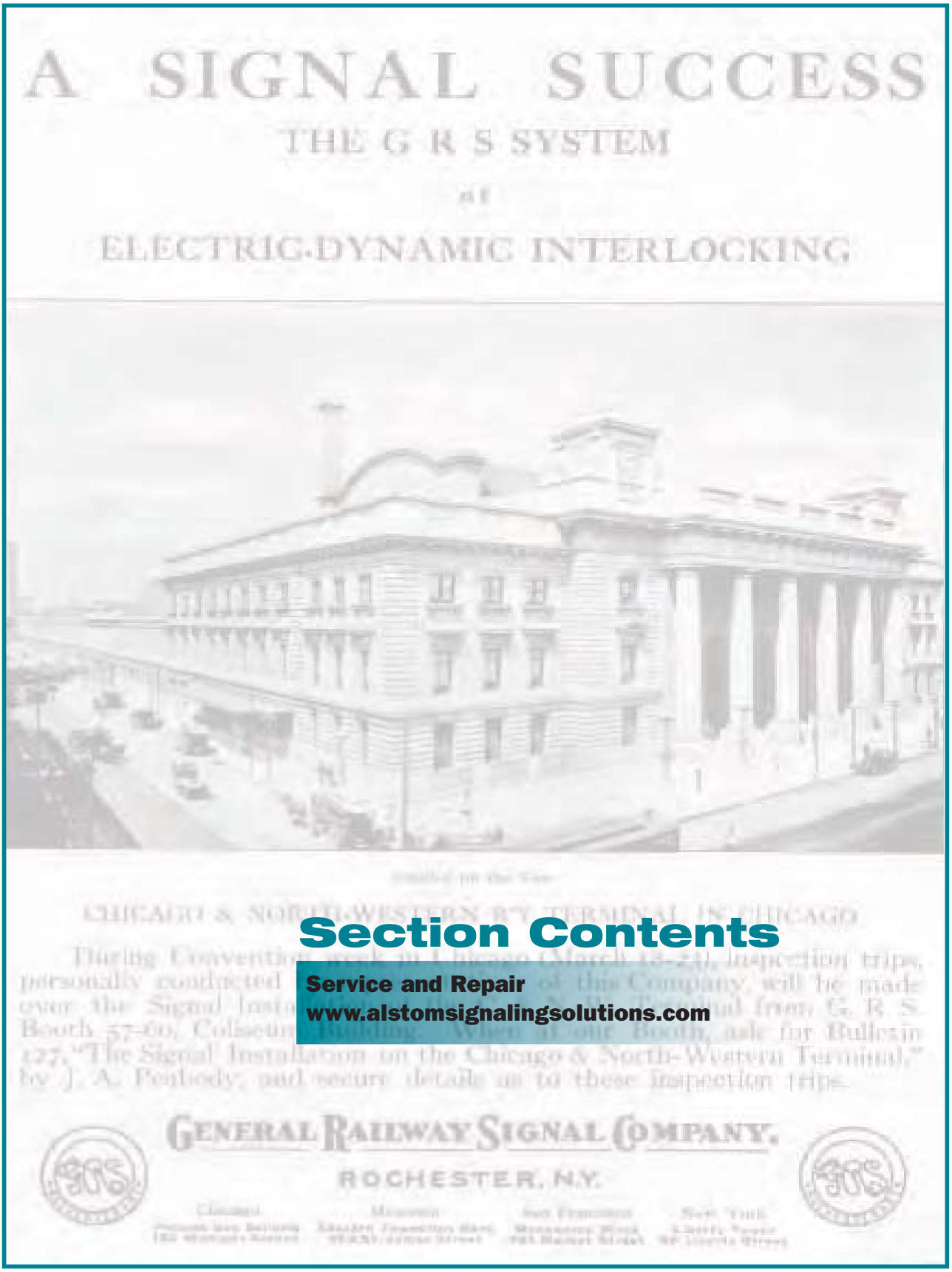

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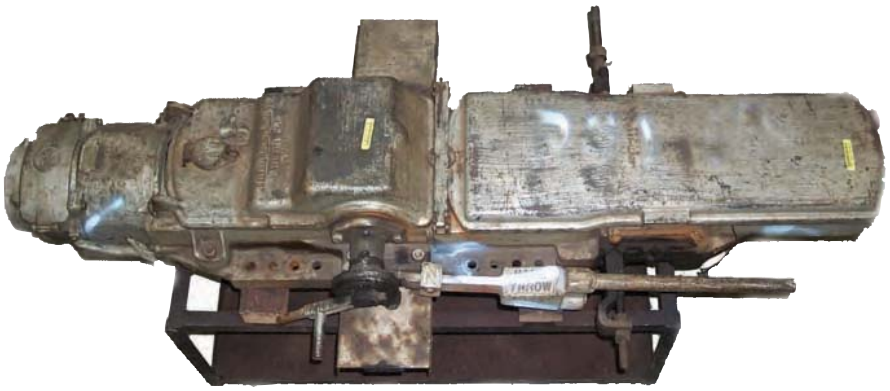

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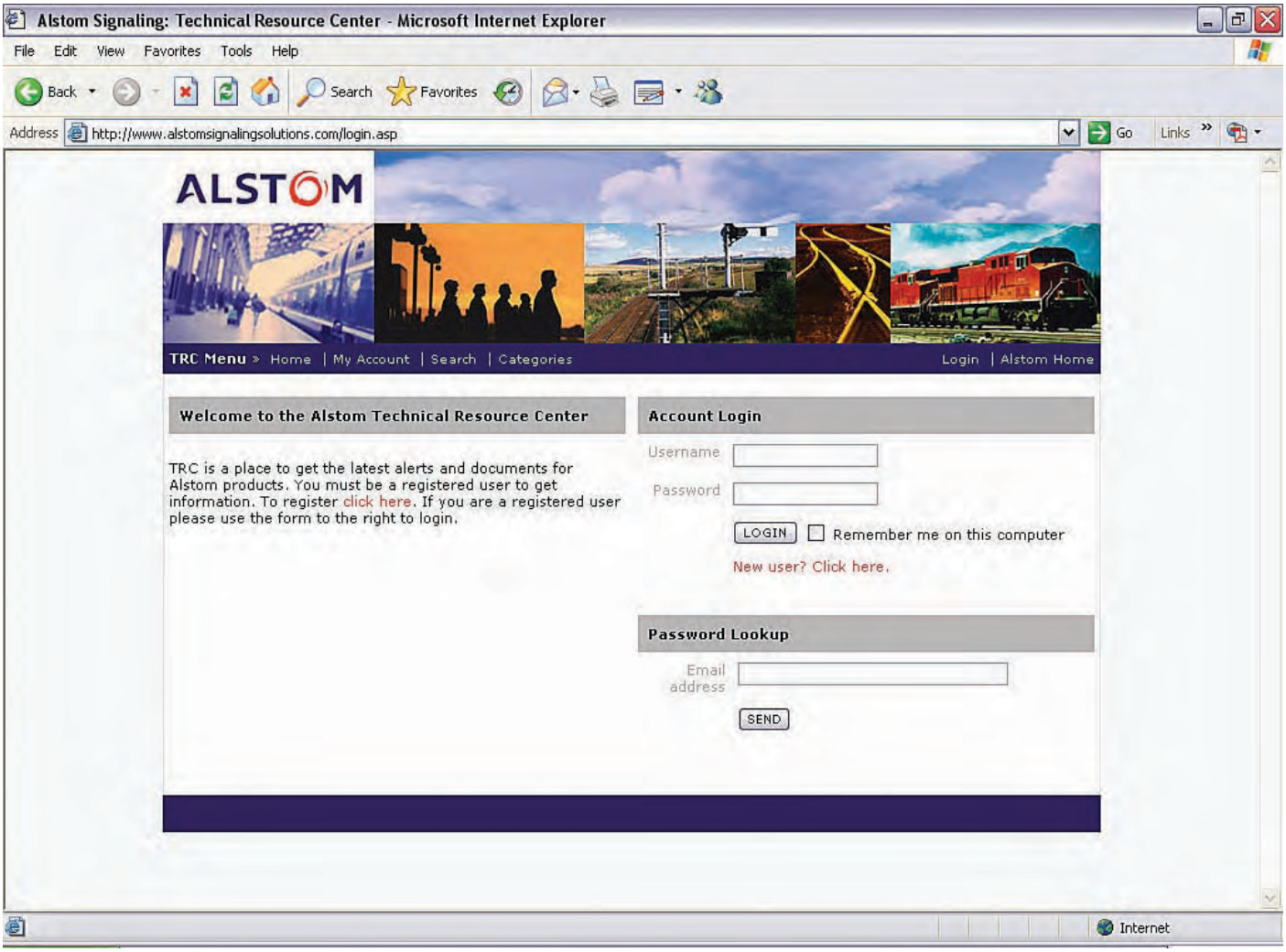
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